Railway Mechanical Engineer

Founded in 1832 as the American Rail-Road Journal
With which are also incorporated the National Car Builder, American Engineer and Railroad Journal, and Railway Master Mechanic. Name Registered, U. S. Patent Office

October, 1935

Volume 109 *No. 10*

Published on the 26th day of the month preceding the date of issue by the

Simmons-Boardman Publishing Company

1309 Noble St., Philadelphia, Pa. Editorial and Executive Offices, 30 Church Street, New York, N. Y., and 105 West Adams Street, Chicago, Ill.

Cleveland: Terminal Tower
Washington: 832 National Press Bldg.
San Francisco: 55 New Montgomery St.

Subscriptions, including 12 regular monthly issues, payable in advance and postage free. United States and possessions: 1 year, $3; 2 years, $5. Canada, including duty: 1 year, $3.50; 2 years, $6. Foreign countries: 1 year, $4; 2 years, $7.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.) and is indexed by the Industrial Arts Index and also by the Engineering Index Service.

Railway Mechanical Engineer

Founded in 1832 as the American Rail-Road Journal

October - 1935

New Locomotives on The Boston & Maine

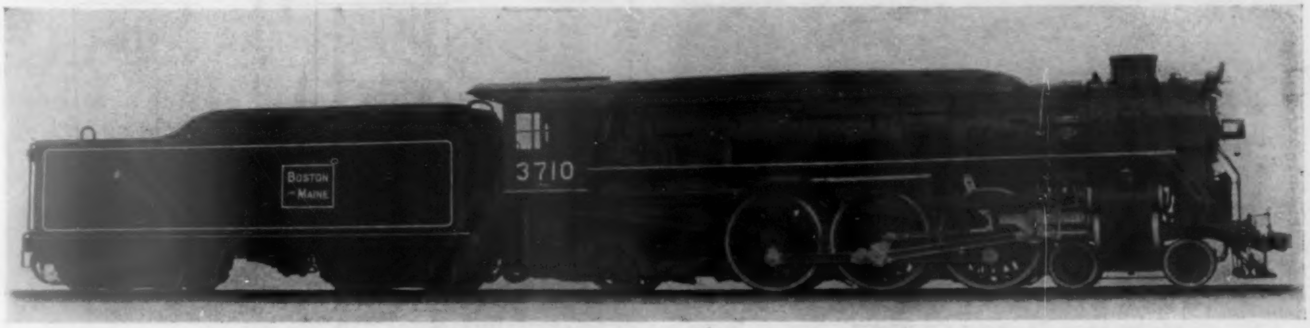
Recent additions include five heavy Pacific type locomotives with 80-in. drivers, built by Lima, and five Mountain type locomotives with 73-in. drivers, built by Baldwin

During the past year the Boston & Maine has acquired five new Pacific type locomotives, built by the Lima Locomotive Works, Inc., which are known on the road as Class P-4-a, and are numbered 3710 to 3714, inclusive. These locomotives are more powerful than any previous Pacific type locomotives on this road. They are heavier, carry a higher steam pressure, and have larger drivers. Their weight in working order is 339,200 lb., exclusive of the tender, of which weight 209,500 lb. is on the drivers, 61,400 lb. on the front truck, and 68,300 lb. on the trailing truck. The steam pressure carried is 260 lb., the cylinders are 23 in. by 28 in., spaced 90 in. center to center, and the driving wheels 80 in. in diameter, with 73-in. centers. This gives a tractive force for the main engine of 40,900 lb. The locomotives are also equipped with Franklin trailer boosters, which increase the total tractive force to 52,800 lb.

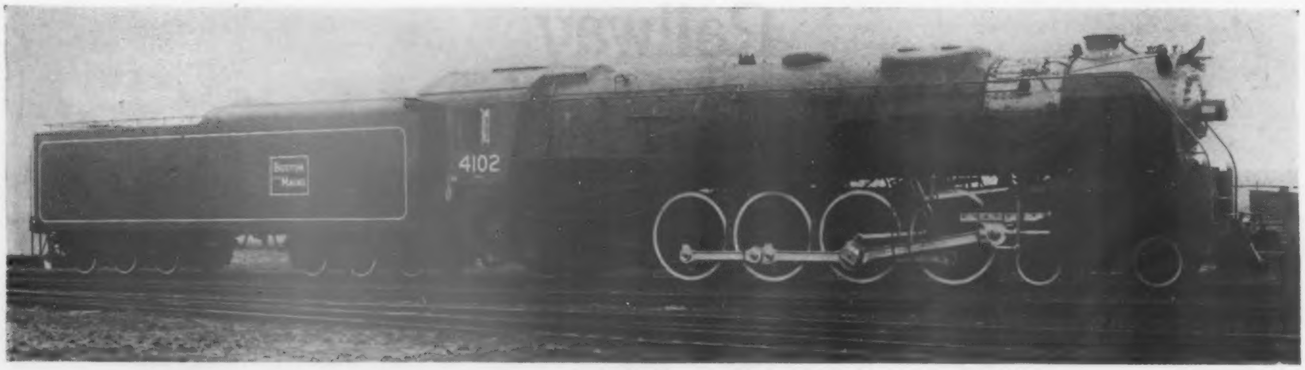
In addition to the large drivers and high tractive force required for handling heavy trains at high speeds, the locomotives have been partially shrouded to assist in reducing wind resistance and have smoke lifters or deflectors on each side of the smokebox, the purpose of which is to direct the flow of air when the locomotive is in operation in such a way as to lift the smoke and carry it above the line of the train. Owing to restricted clearances, the height of the stack has been kept down to 14 ft. 10½ in. and the width overall to 127 in.; the maximum weight per driving axle to 69,900 lb. The light weight of the locomotive alone, without coal or water, is 310,000 lb.

The boiler is of the radial-stayed extended wagon top type measuring 75¾ in. outside diameter at the first course and 85 in. outside diameter at the dome course. The firebox is 114.5 in. long by 85 in. wide, which provides a grate area of 66.9 sq. ft. The grates are of the Firebar type. The fuel used is bituminous coal, fired by a Standard HT stoker. Three Nicholson Thermic syphons, on which the brick arch is carried, are fitted in the firebox. Flexible staybolts are employed in the water space and for the crown. The firedoor is a Franklin Butterfly No. 8a. There are 203, 2¼-in. tubes and 40, 5½-in. flues. The net gas area through the tubes and flues is 1,509 sq. in. The superheater is an Elesco Type A having 966 sq. ft. of heating surface. The evaporating heating surface of the firebox is 320 sq. ft., of which 100 sq. ft. is in the syphons, and that of the tubes and flues is 3,528 sq. ft., giving a total evaporating heating surface of 3,848 sq. ft.

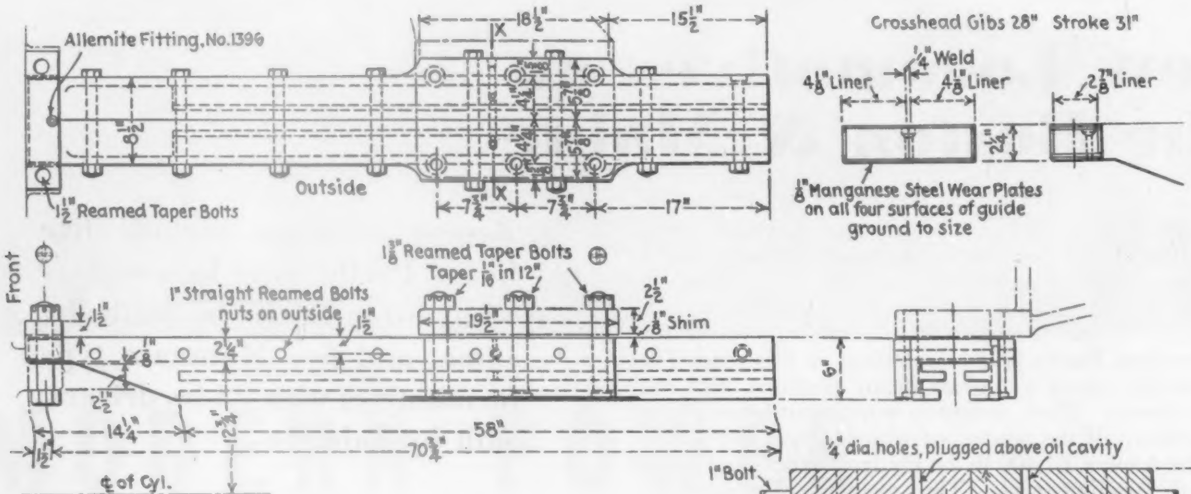
The locomotives are fitted with Coffin feedwater heaters and American multiple type throttle valves. The

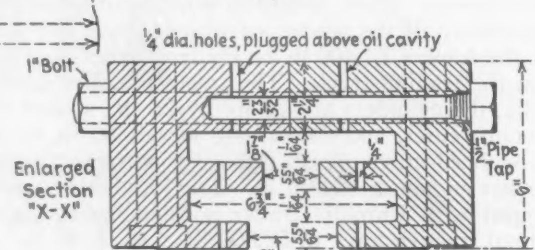


Class P-4-a Pacific type locomotive built by the Lima Locomotive Works for the Boston & Maine

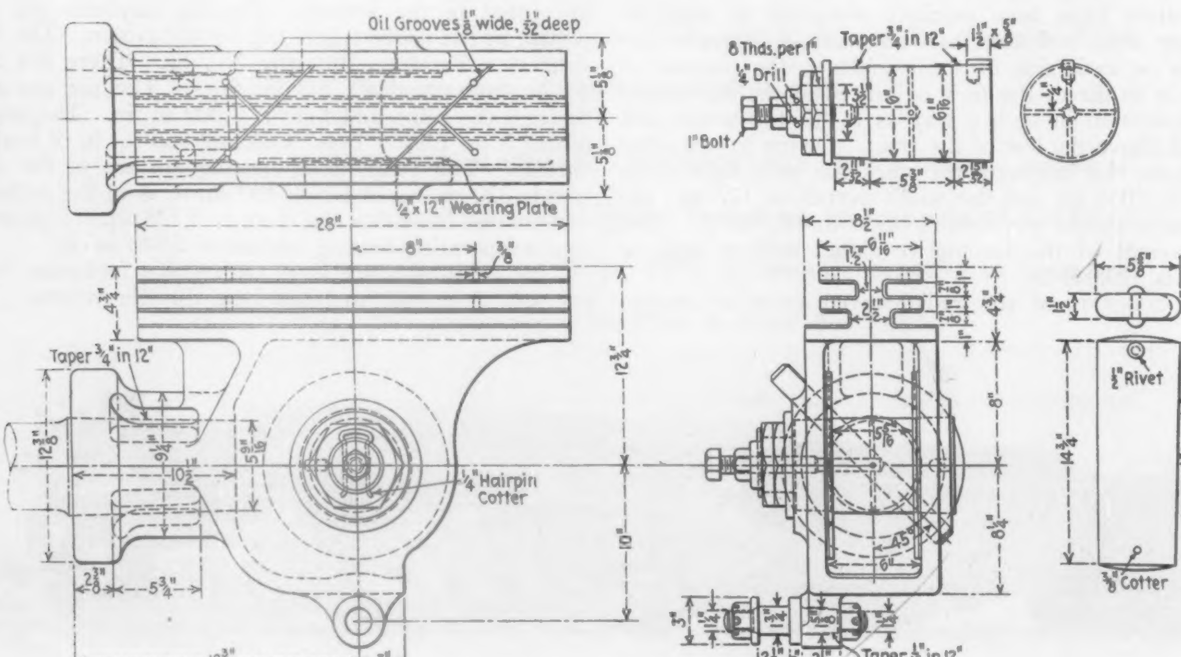


Boston & Maine 4-8-2 type locomotive, Class R-1-a, built by Baldwin Locomotive Works





Modified Dean type guides with multiple ledges on B. & M. Class R-1-a locomotives



Crosshead of multiple-ledge type used on B. & M. 4-8-2 type locomotives

exhaust nozzle is of the annular ported type developed on the Boston & Maine. With a 6-in. diameter cover plate the free exhaust opening is 39.25 sq. in. Exhaust ports at the cylinder saddle are 4½ in. by 10½ in. Superior flue blowers are also used.

Referring to the illustration of the Pacific type locomotive it will be noted that all projections and equipment from the sandbox to the cab have been shrouded under an extension of the locomotive jacket. In addition to the sandbox, the parts shrouded include the dome, safety valves, headlight generator and cab turret. The stack is an oval shape, with a separate passage on the front side which carries the exhaust from the booster and the boiler feed pump. No other shrouding was included in the design.

The cab is roomy, with fixtures well arranged for convenience in operation. A Loco Valve Pilot is used; also a cab indicating signal equipment furnished by the Union Switch & Signal Company. The air brakes are of the new Westinghouse 8ET type with brake valve and associated parts pedestal mounted. There are two 8½-in. cross-compound air compressors mounted on the front deck forward of the steam cylinders.

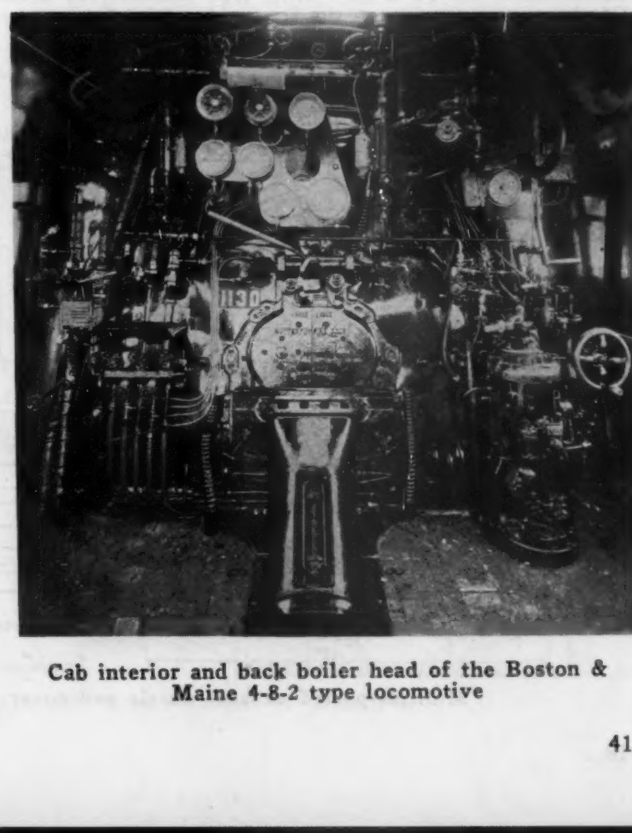
The frames are of rugged built-up construction, 6 in. thick, and spaced 47 in. over the frames. The cylinders are cast steel, securely bolted and welded together, and also rigidly bolted and welded to the frames. A short distance back of the cylinders is a rigid crosstie combining in one piece supporting parts for the guides, brackets for the driver brake cylinders and fulcrum brackets for the driver brake shaft. This crosstie is firmly bolted to the frames and extends to the forward pedestal. Timken roller bearings have been applied to the engine-truck axles.

The valve gear is of the Walschaert type, operating 12-in. piston valves, with a maximum travel of 8 in. Steam ports have a width of $2\frac{15}{32}$ in. Crossheads and guides are of the multiple-ledge or modified Dean type. Alloy steels have been employed for main and side rods, crank pins, eccentric cranks, and piston rods. The steam-pipe casing is of the Reid type developed by the Lima Locomotive Works. A Bausch eight-feed, 20-pint mechanical lubricator is used and all rod fittings are arranged for the Spee-D lubricating device.

The tender is of the rectangular type mounted on a cast-steel, open-bottom type underframe made by the General Steel Castings Corporation. These tenders weight 240,300 lb. loaded, or 104,000 lb. light, and have

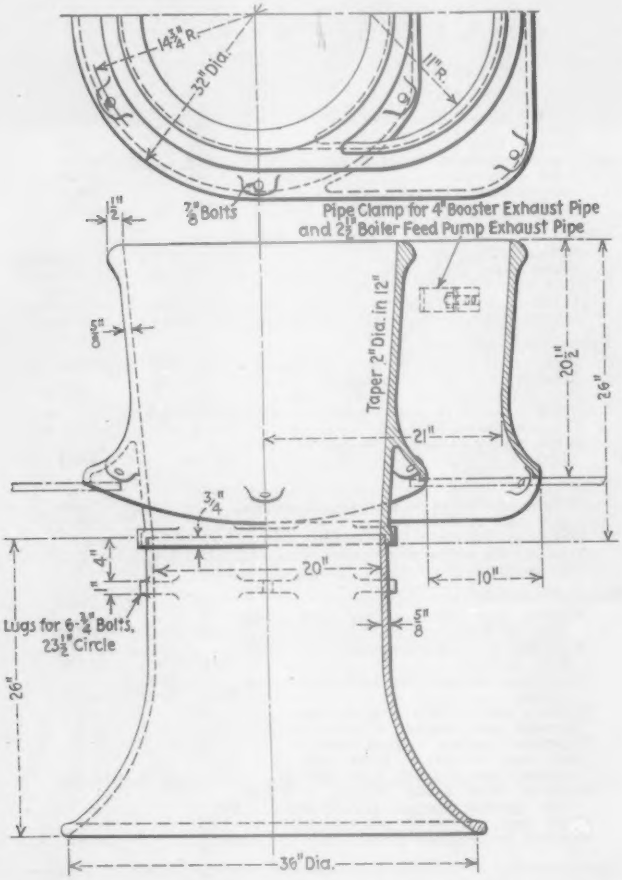
Table of Dimensions, Weights and Proportions of B. & M. Locomotives

Railroad	B. & M.	B. & M.
Builder	Lima	Baldwin
Type of locomotive	4-6-2	4-8-2
Road class	P-4-a	R-1-a
Road numbers	3710-3714	4100-4104
Cylinders, diameter and stroke, in.	23 by 28	28 by 31
Valve gear, type	Walschaert	Walschaert
Valves, piston type, size	12 in.	14 in.
Maximum travel	8 in.	7½ in.
Steam lap	$1\frac{17}{32}$ in.	1¼ in.
Exhaust clearance	$\frac{3}{16}$ in.	⅛ in.
Lead in full gear	⅝ in.	$\frac{6}{32}$ in.
Weights in working order:		
Total engine	339,200 lb.	416,100 lb.
On drivers	209,500 lb.	269,400 lb.
On front truck	61,400 lb.	78,900 lb.
On trailing truck	68,300 lb.	67,800 lb.
Tender	240,000 lb.	377,350 lb.
Wheel bases:		
Driving	14 ft. 0 in.	19 ft. 3 in.
Rigid	14 ft. 0 in.	12 ft. 10 in.
Engine, total	36 ft. 11 in.	44 ft. 2 in.
Engine and tender, total	77 ft. 7 in.	92 ft. 8 in.
Wheels, diameter outside tires:		
Driving	80 in.	73 in.
Front truck	36 in.	36 in.
Trailing truck	49 in.	38 in.
Boiler:		
Steam pressure	260 lb.	240 lb.
Diameter, first ring, outside	75¾ in.	84 in.
Diameter, back end, outside	85 in.	96 in.
Firebox, length and width in.	114⅛ by 84	126⅛ by 90¼
Height mud ring to crown sheet, back	68½ in.	71⅝ in.
Height mud ring to crown sheet, front	89 in.	87¼ in.
Arch tubes	None	None
Syphons	3	4
Combustion chamber, length	None	66 in.
Tubes, number and diameter	203—2¼ in.	53—2¼ in.
Flues, number and diameter	40—5½ in.	201—3½ in.
Net opening through tubes and flues	1,509 sq. in.	1,845 sq. in.
Length over tube sheets	20 ft. 0 in.	19 ft. 0 in.
Fuel	Soft coal	Soft coal
Stoker	Std. HT	Std. HT
Grate, type	Firebar	Firebar
Grate area, sq. ft.	66.9	79
Superheater, type	A	E
Feedwater heater	Coffin	Coffin
Heating surfaces, sq. ft.:		
Firebox and comb. chamber	220	352
Syphons	100	122
Firebox, total	320	474
Tubes and flues	3,528	4,070
Total evaporative	3,848	4,544
Superheating	966	1,924
Comb. evap. and superheat	4,814	6,468
Tender:		
Style	Rectangular	Rectangular
Water capacity	12,000 gal.	20,000 gal.
Fuel capacity	18 tons	21 tons
Trucks	Four-wheel	Six-wheel
Journals, in.	6½ by 12	6½ by 12
General data, estimated:		
Rated tractive force, 85 per cent, engine	40,900 lb.	67,000 lb.
Rated tractive force, booster	11,900 lb.	......
Potential horsepower (Cook)	2,913	3,862
Speed at 1,000 ft. piston speed	51.0 m.p.h.	42.1 m.p.h.
Piston speed at 10 m.p.h.	192.5 ft.	237.5 ft.
Boiler evapor. capacity, lb. per hr. (with heater) (Cook)	54,063	69,914
Weight proportions:		
Weight on drivers ÷ total weight engine, per cent	61.8	64.8
Weight on drivers ÷ tractive force	5.13	4.03
Total weight engine ÷ potential hp.	164	177
Total weight engine ÷ comb. heat. surface	70.5	64.4
Boiler proportions:		
Firebox heat. surface, per cent comb. heat. surface	6.65	7.33
Tube-flue heat. surface, per cent comb. heat. surface	73.3	62.92
Superheat. surface, per cent comb. heat. surface	20.05	29.75
Firebox heat. surface ÷ grate area	4.78	6.0
Tube-flue heat. surface ÷ grate area	52.7	51.5
Superheat. surface ÷ grate area	14.45	24.35
Comb. heat. surface ÷ grate area	71.9	81.9
Tractive force ÷ comb. heat. surface	8.5	10.35
Tractive force × dia. drivers ÷ comb. heat. surface	681	756
Comb. heat. surface ÷ potential hp.	1.65	1.68
Potential hp. ÷ grate area	43.55	48.90



Cab interior and back boiler head of the Boston & Maine 4-8-2 type locomotive

a capacity for 12,000 gallons of water and 18 tons of coal. The distance from the rail to the deck is 83⅜ in. The trucks are General Steel Castings equalized, four-wheel design, with 36-in. wheels, 6½-in. by 12-in. journals, and Isothermos truck boxes. The wheel base is 6 ft. 9 in., and the distance between truck centers is 21 ft. The total length of the tender is 38 ft. 4⅛ in. and engine and tender over coupler faces is 88 ft. 8 7/16 in.

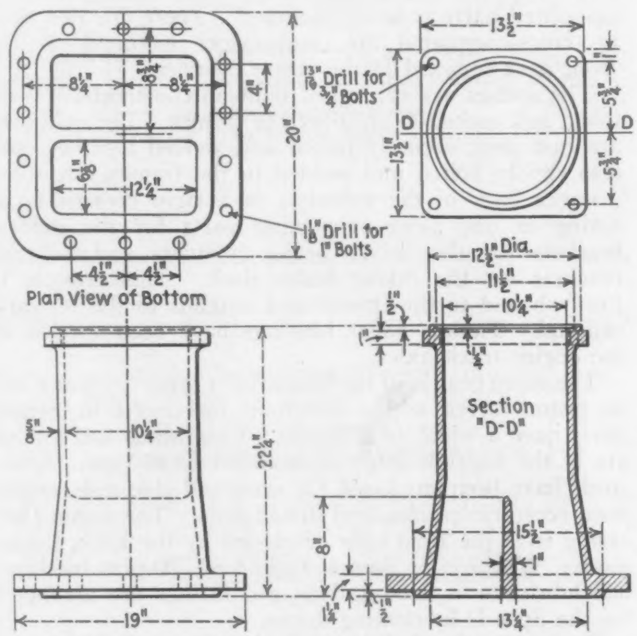


Smokestacks for B. & M. Pacific type locomotives Class P4a have an extension on the front side which houses the exhaust pipes from booster and boiler-feed pumps

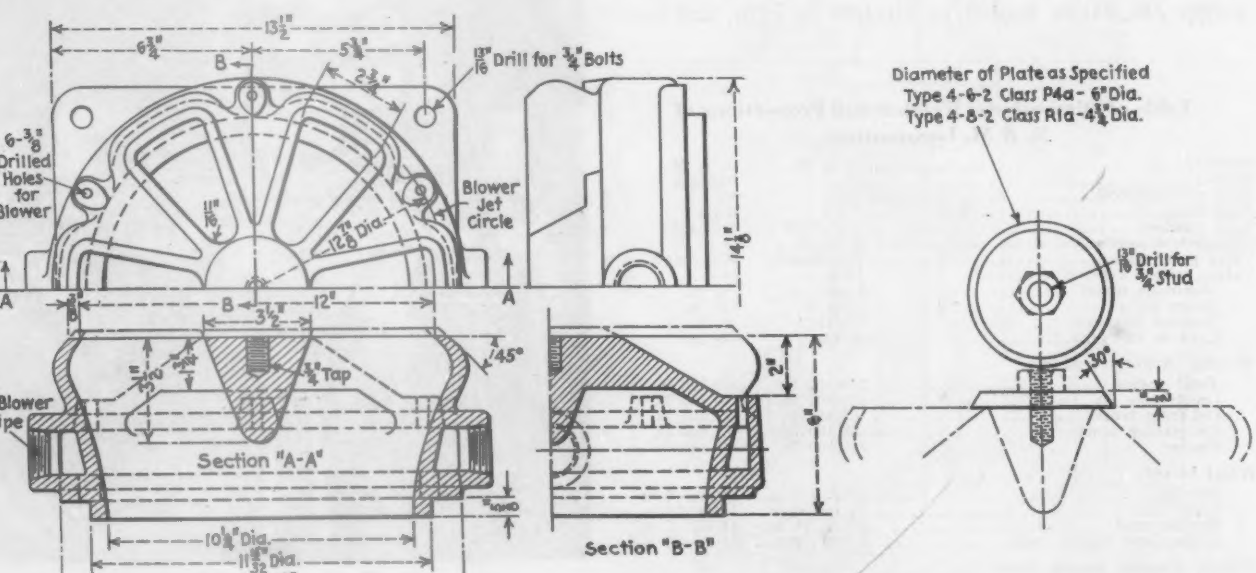
Mountain Type Locomotives

The five Mountain type locomotives, which were built by the Baldwin Locomotive Works, are the first locomotives of the 4-8-2 type placed in service on the Boston & Maine. Previous freight locomotives which had been purchased since 1920 were all either 2-10-2 type, with 61-in. drivers, or 2-8-4 type, with 63-in. drivers. The new locomotives are numbered 4100 to 4105 and are known on the road as Class R-1-a. They have 73-in. drivers, with 66-in. wheel centers, and the boilers are of generous capacity. This fits them well for either heavy fast freight or for heavy passenger service.

These locomotives weigh 416,100 lb. in working order, of which 269,400 lb. is on the drivers, 78,900 lb. on the front truck and 67,800 lb. on the trailing truck. The light weight of the engine alone, without coal or water, is 376,100 lb. The steam pressure carried is 240 lb. The cylinders are 28 in. by 31 in., spaced on 92-in.



Exhaust pipe for B. & M. 4-8-4 type locomotives Class R1a



Multiple-ported exhaust nozzle and cover plate used on Boston & Maine locomotives

centers. This gives a rated tractive force of 67,000 lb. Smoke lifters or deflectors are provided on each side of the smokebox. Clearances being restricted, the height of the stack was made 15 ft. 4⅞ in., and the width overall 127 in. The maximum axle load is 68,900 lb.

The outside diameter of the first ring of the radial-stayed boiler is 84 in., and the large diameter next to the throat sheet is 96 in. The center of the boiler is 126 in. above the top of the rail. The firebox is 126⅛ in. long by 90 in. wide, which gives a grate area of 79 sq. ft., and is fitted with three Nicholson Thermic syphons. An additional syphon is also placed in the combustion chamber which is 66 in. long. Fuel is bituminous coal, fired by a Standard HT stoker, and grates are of the Firebar type. There are 53, 2¼-in. tubes and 201, 3½-in. flues, the length over tube sheets being 19 ft. The evaporating heating surface of the firebox, including 122 sq. ft. in the syphons, is 474 sq. ft., and for the tubes and flues 4,070 sq. ft., which gives a total evaporating heating surface of 4,544 sq. ft. The Type E superheater contains 1,924 sq. ft. of heating surface. The net gas area of the tubes and flues is 1,845 sq. in.

Coffin feedwater heaters are fitted to these locomotives. The cylinder saddle is carried well up on the smoke arch and has pockets which permit the steam pipes to be located entirely inside the smokebox chamber. The smokestack is 50½ in. long, 20½ in. diameter at the choke, and has a 36-in. diameter flare at the lower end. The distance from the top of the exhaust nozzle to the smokestack is 18 in. The exhaust ports at the cylinder saddle measure 6⅛ in. by 12¼ in. each. The exhaust stand or nozzle pipe tapers to a 10¼ in. inside diameter and is 22¼ in. high. The exhaust nozzle is of the annular ported type developed on this road. The nozzle used on these locomotives is of 12-in. diameter over the exhaust ports and 6 in. high. The free area of the six ports is 48.07 sq. in., which is reduced to 47.69 sq. in. by a central cover plate, 3½ in. in diameter.

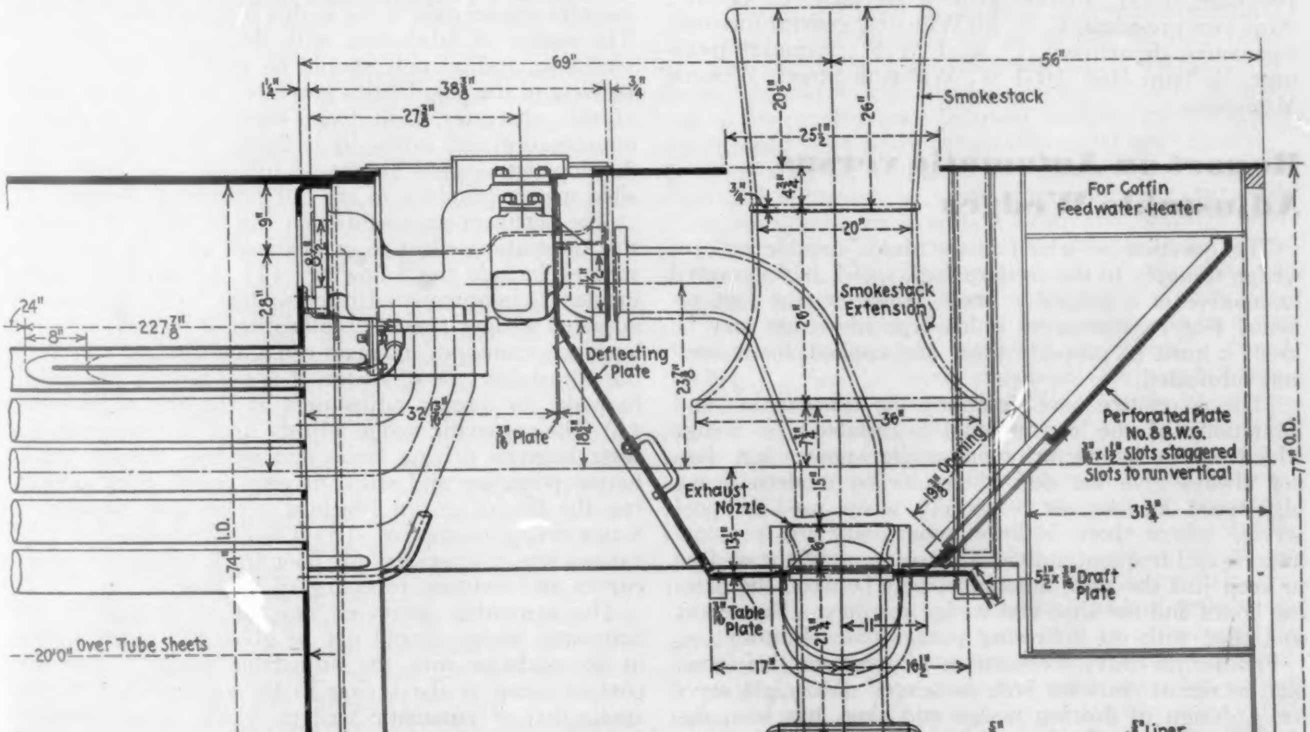
The boiler is mounted on a cast-steel foundation bed furnished by the General Steel Castings Corporation, in which is combined the air reservoir and other parts which are made integral. The driving boxes are spaced on 40-in. centers. Axles are of the hollow-bored type. The journals on the main driving axle are 13¼ in. by 14 in., and 11½ in. by 14 in. on the other driving axles. The engine truck has 36-in. wheels, 7½-in. by 12-in. journals, inside bearings, and a wheel base of 7 ft. 4 in. Timken roller bearings have been applied to the engine-truck axles. The trailing truck has 38-in. wheels and 9-in. by 16-in. journals. The total wheel base of the engine is 44 ft. 2 in., while the length over coupler faces of the engine and tender is 105 ft. 8⅜ in.

The valve gear is of the Walschaert type, operating 14-in. diameter piston valves, with a maximum travel of 7½ in. The eccentric crank circle is 17½ in. Steam ports are 2¼ in. wide. The crossheads are of the multiple-ledge modified Dean type which have been giving excellent service on the Boston & Maine.

A Detroit mechanical lubricator with eight pumps is applied. The discharge from each pump is divided so as to feed in four directions. This lubricator supplies oil to the shoes and wedges, driving-box hubs, trailer-truck hubs, and valve guides. A Detroit six-feed Model A mechanical lubricator supplies lubrication to the steam chests, cylinders and crosshead guides while a Nathan hydrostatic lubricator is used for the air compressors and the stoker. Alemite grease lubrication fittings are provided at many points and Spee-D fittings for the rods.

The tender is of the rectangular type, having a capacity for 20,000 gallons of water and 21 tons of coal. Its weight is 377,350 lb. loaded, or 160,300 lb. light. It is mounted on a General Steel Castings water-bottom underframe. The trucks are General Steel Castings equalized six-wheel type, with Isothermos journal boxes. The trucks have 36-in. wheels, 6½-in. by 12-in. journal axles, and a 10-ft. wheel base. The distance between truck centers is 26 ft. 1 in. The total length of the tender is 46 ft. 4 in. and the combined length of engine and tender over coupler faces is 105 ft. 8⅜ in.

The principal proportions are shown in the table.



Smokebox arrangement of Boston & Maine Pacific type locomotives Class P4a

General Foremen Hold Two-Day Meeting

Five committee reports are presented in interesting and constructive program at Chicago

IN spite of a limited attendance at the annual meeting of the International Railway General Foremen's Association, held at Chicago September 17 and 18, the program of five committee reports and the subsequent discussion proved unusually interesting and suggestive of ways and means to effect further improvements in the maintenance of railway equipment. The meeting was presided over by President A. H. Keys, district master car builder, Baltimore & Ohio; details of the program were arranged by Secretary-Treasurer William Hall, Chicago & North Western. After some introductory remarks by M. D. Franey, consulting engineer, New York Central, committee reports were presented on the following subjects: "Automatic versus Adjustable Wedges for Locomotives," "Lubrication of Locomotives, Cars and Appurtenances," "Shop Practice as Applied to Repairs of Modern Power," "Methods of Measuring Shop Efficiency," and "How to Establish and Maintain Safe Operation in a Locomotive Shop." Abstracts of some of these reports will be included in the following pages.

Election of Officers

At the conclusion of the business session, an election of officers was held, at which Mr. Keys was urged to accept re-election and to continue to direct the affairs of the association for the coming year. This he agreed to do and the following were elected officers of the Association for the year 1935-1936: President, A. H. Keys, district master car builder, B. & O.; first vice-president, J. B. Dunlop, shop superintendent, C. N.; second vice-president, J. H. Fedler, general foreman, C. G. W.; third vice-president, C. F. McWilliams, general foreman, locomotive department, C. R. I. & P.; secretary-treasurer, William Hall, 1061 W. Wabasha Street, Winona, Minnesota.

Report on Automatic versus Adjustable Wedges

The question of which is the more suitable type of wedge to apply to the modern high-speed, high-powered locomotive is a debatable one. However, the fact remains that regardless of which type of wedge may be used, it must be properly fitted and applied, maintained and lubricated.

[The committee here described the construction and limitations of the conventional adjustable-type wedge which works satisfactorily on smaller power but does not always give the desired results on modern heavy high-speed locomotives, especially when used in pool service where there is little opportunity for personal interest and frequent individual adjustment of the wedges to keep just the right amount of play between the driving boxes and the shoe and wedge castings. The report continued with the following paragraphs.—Editor]

For use on heavy locomotives of great tractive force, built in recent years for both passenger and freight service, a design of floating wedge and shoe, has been developed. The results from this design, even with minimum maintenance resulting from curtailed expenditures during recent years, have been good. This wedge, which is used in connection with a shoe, is made of cast or open hearth steel; and, when this design is properly assembled and applied, provided it is kept in adjustment and well lubricated, it is a decided improvement over the one-piece solid wedge. This assembly is not automatic, but with proper application, lubrication and adjustment at the right time and under approved conditions, there is a minimum wear of the parts.

Having in mind the human element that enters into the wedge adjusting work, there has been considerable study made of devices which will automatically maintain wedge adjustment under the varying conditions under which a locomotive must be operated. Such of these devices as have been developed are not in general use; in fact, it may be said, they are largely experimental. If the automatic-type wedge is in use, it should be properly fitted to the frame and box during the original application and subsequent shoppings; and the spring should be properly set and adjusted. During the period the locomotive is in service, the automatic spring should be tested before or after each trip, and the wedge tried in order to ascertain if the wedge is functioning properly. The matter of lubrication with this type of wedge is a vital one, and oil only should be used for this purpose. In view of the possibilities presented for a reliable device of this character, both from standpoints of operation, maintenance and safety, it is highly desirable that this development should be closely followed and every possible means provided to try out promising designs.

The pertinent arguments that can be made in favor of the automatic wedges in comparison with the solid type wedges include the following: (1) Avoiding of shocks incident to improperly adjusted wedges. (2) Improperly adjusted wedges cause crystallization of frames; side-rod bushings, crank-pin and main-rod brass trouble. (3) With the adjustable type of wedge, it is not always convenient to make the proper adjustment at the critical moment. (4) The automatic wedge adjusts itself to compensate for wear between driving boxes and wedges, thereby eliminating pounding and stuck driving boxes, thus increasing the life of crown bearings. This also provides a better riding locomotive. (5) The above applied to yard locomotives compensates for poor track conditions, sharp curves and constant reversing of locomotive.

The somewhat increased cost of application of the automatic wedge should not be given too much weight in comparisons with the adjustable wedge. The important factor is the saving to be accomplished by the application of automatic wedges which, when properly maintained and lubricated, tend to eliminate the human element in wedge adjustment and provide increased safety in locomotive operation, as well as greater re-

liability in meeting difficult schedule requirements.

The report was signed by Chairman W. E. Lehr, general foreman, B. & O.

Discussion

In the discussion following this committee report, several members of the association mentioned specific instances in which the automatic wedge proved inadequate for the main and intermediate wheels of heavy modern power. The statement was made that automatic wedges are a boon to railroad men when used on Mikado and other smaller locomotives but that they do not always have sufficient capacity to hold the main boxes on the largest locomotives.

Report on Lubrication

This subject presents contrasting thoughts. That is we think of a bearing as two surfaces more or less accurately fitted in such a manner that contact will be made, at intervals at least, over the entire area of both surfaces. This frequency of the bearing spots or the continuity of detached areas with their tendency to finally merge, is our index of the accuracy of the bearing fit. As an example of accurate surfacing we may examine a pair of gage blocks "wrung" together and held in contact solely because of the accuracy of the surfaces. After we have secured a bearing or fit to suit our needs, we lubricate to prevent the accurately finished surfaces from coming into contact when in service.

Lubricating engineers teach us that a constant film of oil is at all times normally between lubricated bearing surfaces and that the bearings rest on the oil film rather than on the metal surfaces.

The choice of lubricants or the manner of their application is usually determined by other than the shop supervisory forces. Also companies furnishing lubricants, as a rule, have a staff of experts who from time to time visit their customers and direct or recommend the practices best suited for local needs. For these reasons, the committee feels that their efforts should be directed principally toward the preparation of bearings, their maintenance, and such practices as are considered sound in the general use of lubricants. Also that their report should not be taken as conflicting with practices now established and found best where followed.

Finishing practices vary between wide extremes. Grinding is now widely used and is entirely successful as is attested by the service given by millions of bearings in today's automobiles. Burnishing has been followed in finishing car journals ever since the passing of the water-finished iron car axle. The fact alone that the major amount of railway car movement in America is carried on roll-burnished journals is proof of the success of this method of finishing. Before the use of steel axles, water finish cuts, without any further efforts toward polish, was the common method of finishing car journals. An experienced lathe hand could, by this method, using a flat-nosed tool and a stream of water, put a high polish on the journal of an iron axle. Some bearings are still finished by the ancient file and emery cloth method and are giving satisfaction.

No matter what method is practiced in preparing the bearing, if successful lubrication is sought, one inflexible rule must be observed; that is, that the bearings must be properly finished and fitted. Then, not only must individual bearings be correctly assembled but companion parts be spaced or adjusted so that the entire assembly functions without strain or binding in any one part. To attain these results accurate machining is a first essential which in turn calls for accurate machine tools. Back of all stands a demand for a higher standard of maintenance of shop equipment that the tools and the product may be kept accurate. As an example we might mention the main driving axle of a modern road locomotive. Although the journal bearing may have a good appearing gloss and be, as sometimes said, "not more than a full sixty-fourth out of round," if the journal is mounted on centers be assured there will be found a decided flattening about 135 deg. in advance of the pin. An eccentricity of 1/32 in. or more may also be found. The reason is that the main pin takes the greatest load between the center and the quarter while the axle in turn forces heavily against the driving-box bearing with the main pin in this zone. In other words the greatest axle wear occurs while the main pin passes the upper back and lower forward eighth.

Now if the bearing is not turned, while a fairly satisfactory driving-box fit may be made, in tramming the locomotive after wheeling we may be able to tram exactly at one point but find a decided error after moving the engine a quarter or a half turn of the drivers. The point that once was the center of the axle is no longer the center when the worn bearing revolves in the driving box.

The same condition applies to the main pin. The greatest wear will be found at the point where the pin receives the main-rod thrusts on the two eighths mentioned. It is evident then that if the journal is turned the pin should likewise be turned in order to secure correct quarter and stroke. Uncorrected errors of the type mentioned will cause rod-bushing trouble that cannot be overcome by any lubricant. True, when sufficient slack wears into the bearings, or if originally fitted sufficiently loosely, little trouble beyond premature pounds and bushing renewals may occur. Nevertheless the mileage before renewals in bearings loosely fitted to compensate for other faults will never equal that from accurately machined parts properly fitted and correctly assembled.

In order that the lubricant may reach the bearings, certain provisions must be made to convey the lubricant. Clearance to provide space for an oil film between bearings and shafts, or pins, has been found necessary by automobile and machine-tool builders. This is in contrast to the practice once followed in fitting certain types of soft metal lined bearings metal to metal and "burning" the fit by running it until sufficient wear accumulates to allow the lubricant to cover the contacting surfaces. Clearance allowances on certain locomotive bearings must be followed in a manner suited to the particular needs of the machine. For example, if, on a locomotive, the combined length of a back-end bearing and a main side-rod connection bearing, both of brass, equals some given dimension and the temperature of the pieces is raised 100 deg. F., then the lateral expansion will be sufficient to bind a bearing that is free when cold. As the expansion of steel is only about 60 per cent of the expansion of brass, if the temperature of the pin increased as rapidly as the bearings, which is improbable, in the initial heating of the assembly, the pin would still be noticeably shorter than the enclosing bearing. A good rule in this work is to allow at least .003 in. per inch in length for the difference in the expansion of the two metals.

In finishing floating rod bushings unless proper expansion allowance is made there will be a tendency for the floating bushing to tighten in the stationary bushing. A good practice is to make the inner diameter a close fit on the pin; merely enough larger to slide on, say .005 in. per inch in diameter, then finish the outside .003 in. per inch of diameter smaller than the stationary bushing. On a 13 in. diameter we will have approximately

.039 in. clearance outside and .006 in. inside, a total of .045 in. or roughly 3/64 in. With the brass at a running temperature there will be a fairly equal clearance inside and outside of the floating bushing.

Driving-box bearings in the application to the driving box seem to be fitted too tight oftener than too loose. The bearings should be accurately machined to fit the slotted recess in the driving box which first should be accurately machined to receive the brass. A pressure allowance of one half to one ton per inch of outer diameter of the crown brass or a range of from 5 to 15 tons will be found more satisfactory than pressures of 50 tons or more sometimes used. Excessive pressure puts a severe initial tension on the driving box and, if the brass becomes heated there is a tendency for the box to close at the bottom and to pinch the brass on the journal. Two to three thousandths per inch of axle diameter larger in boring the box makes a satisfactory clearance. Some authorities favor not over three thousandths per inch for boxes other than main and slightly less for main boxes.

The question of fitting driving boxes to journals, after boring the boxes, is debatable. However, whether fitted or not it is always advisable to know that the crown brass bears at the top rather than pinches at the edges.

Proper oil or grease grooving of bearings is important. Cored grooves must be thoroughly cleaned of sand. Not only is loose sand to be avoided but also crusted or scaled matter within the groove. Otherwise as the bearing wears the scale contacts the journal and causes heating. The location of grooves is usually determined by the engineering department. If left to the shop, grooves should not be placed at the point where the greatest load is imposed but rather in advance of that zone. It is highly important that the edges of grooves be liberally rounded as it has been found that an abrupt edge will hinder the passage of the lubricant. Driving boxes should have the edges of the crown brasses cut away to aid lubrication. This lubrication clearance must not be overdone. If the clearance extends too high above the center line, the box will tend to lift from the journal when the locomotive is working hard.

[The committee here included a discussion of more or less general practice regarding the lubrication of engine-truck journals, car journals, and other special equipment including internal combustion engines.—Editor]

The report was signed by F. M. A'Hearn, general foreman, B. & L. E.

Report on Safety

[In considering the subject "How to Establish and Maintain Safe Operation in a Locomotive Shop," the committee covered such general features as safety shoes, goggles, machinery guards, marking of aisles, inspection of hand tools, clothing, respirators, gloves and first-aid room, and closed the report with the following paragraphs.—Editor]

Possibly after hearing this paper all are remarking, "Same old stuff—everything in there has been covered time after time and we all know about it and are doing it." If so, when you get back to your shops, it might be a good idea to try the following:

Select, after careful and deliberate thought, three workers known to be of the aggressive type and instruct them to the effect that they are chosen from the rest of the shop employees for their interest in safety, that they are to serve as, shall we say, a super safety committee and that an afternoon is to be given them to use for a shop inspection to include all departments. They are to report in writing any unsafe practice on the part of workers, any appliance or tool or machine guard which they consider needs attention. In short, have them understand that any thing they see that they do not consider safe is to be reported. Have them understand also, that anything reported by them will be handled in such a manner that no one will be offended and consider the committee squealing.

To be effective the use of a committee such as the one described above, oftener than every six months is not recommended.

I wager you will find, after receiving the report of this committee, conditions that will wake you up and make you realize that although you may know all about these things that I have spoken of, you are not doing them to the extent that you think you are.

Any unsafe practice can be stopped, no matter how general it is, by the concerted action of all supervisors with the cooperation of a properly backed safety committee.

I have refrained so far from using the first person in this paper, but to better illustrate how concerted action can stop an unsafe practice, let me cite a concrete example, one of several instances where concerted action brought results.

Running by employees at whistle time had been giving us much concern and had contributed to several accidents, none serious, but never-the-less accidents, and likely to be serious if running were allowed to continue. Notices that running in shop was a violation of safety rules did not bring the required results as practically every employee was indulging in this bad practice. I finally called my supervisors together and told them that we were going to stop employees running at whistle time. The safety committee and delegates were also informed of our purpose. They were to instruct, immediately after the meeting, each man under their immediate supervision that running was to be cut out at once. I also assigned each supervisor for one week, to a particular location in the shop with instructions to stop any employee who was running and ask if his supervisor had not spoken to him on the subject of not running to the washroom. This action completely broke up this unsafe condition and proves that no condition detrimental to safe operation can exist if proper corrective measures are exerted on the part of the local shop management.

To sum up, the maintenance of shop safety is a continual, never relaxing effort on the part of all employees. Safety must be handled by the local management in the same manner that production is. One is just as important as the other and under no circumstances should any one be allowed to cut corners on safety rules in order to get production. Both have an important part to fill and proper consideration must be given by all concerned to see that one does not edge the other out of the picture.

The report was signed by M. A. R. Slack, general foreman, New York Central.

* * *

Accident No One Noticed—Henry Frost, a farmer living near Hazen, N. D., drove his auto and trailer across the Northern Pacific tracks at that place recently at about the time a train passed. Neither Henry nor the train crew were aware that anything out of the ordinary had happened. When, however, the train reached the coal dock, the crew found the trailer's wheels draped over the locomotive pilot, and Henry, on arriving home, found his trailer missing. Henry and the crew thereupon put their heads together and decided that Henry had not quite beaten the train to the crossing, after all.

What Would You Have Done?

A little enginehouse drama enacted in three scenes

Scene I—Roundhouse

Bill Jones, roundhouse foreman, after having been on continuous duty for 14 hours, at last found time to sit down and look over his mail—he has no clerk now—and found the following "personal" from the superintendent of motive power:

"It has recently come to my attention that you are permitting employees to remain at work while plainly under the influence of liquor. You are well aware this is strictly against the rules of this and every other railway company. What have you to say? If this proves to be true, you know the penalty. Arrange to report at my car tomorrow at 2:00 p.m., with your explanation."

Scene II—In the Roundhouse Next Day at Noon

"Joe! Keep an eye on the work to be done on 2380; she's getting that new piston. The backshop promises to have it over here by 2:30. There's quite a few jobs on her and she must be ready for the fast manifest leaving at 5:00 a.m. I've got a call to interview the S.M.P. and I don't know how long he will keep me."

Scene III—In the S. M. P.'s Car Same Day

"Well, sir, you got my letter; what have you to say for yourself? It is just too bad for a man who has railroaded as long as you have to get himself into a jam like this. I thought you always posed as a strictly temperate man opposed to drinking at any and all times, and here you are with stories like this coming to me"—all of this being said so rapidly that Bill could do nothing but listen. "Now I don't want to listen to any excuses; all I want to know is whether it is true, or not true."

"Well, sir, it is partly true, but in this case I ——."

"You heard me say I want no excuses. If it is partly true and you say it is, you are through. Do you hear? Through!"

"Very well, sir. Do I go back as a machinist, or am I out altogether? I'd just as lief go back to the bench. While I'd not make so much a month, I'd be getting more per hour and also get a chance to have a few hours with my kiddies which I haven't had for several months."

"Do you mean that?"

"Yes, sir, I do. I never asked for this foreman's job, but took it when asked to do so three years ago when Mr. Steele was retired. I've always tried to carry on the best way I knew and have successfully met many emergencies not recorded or reported to you."

"Do you think allowing your men to go around drinking is the best way to meet emergencies? Is it the proper way to run any shop, let alone a roundhouse? I cannot conceive of anything so destructive of morale or discipline. You cannot get results that way and, by G——, it's results I want."

"Well, sir, now that I'm through, perhaps you'll let me give you all facts in the case, not as a plea for my job, but to let you see just what situations we have to meet sometimes."

"Go ahead! I don't think you can tell me anything I do not already know."

Some Order!

"Well, I received instructions from your office some time ago that further economies must be made; that under no circumstances must any overtime be worked; that no vacancy would be filled no matter who might quit without writing it up, fully explaining, and no action be taken until a reply was received (it usually takes a week to get a reply to a letter to your office); also that no excuse would be taken should any engine be tied up by a federal inspector; neither would there be any accepted should there be any delay caused by lack of readiness for service of any power when called for." (Pause).

"Well, go on; nothing wrong so far."

"The night in question there were two special manifest freights going through. We were in good shape to furnish power for one, but the other was going to keep us quite busy to get her ready for high-speed service by 5:00 a.m.

"I was remaining on duty until 11:00 p.m., when the night men came on, in order to make sure that each got the assignment he was best fitted for, so that nothing would be overlooked, as I wanted no alibi. If anything went wrong it would be up to me, no one else. We now have, since the last reduction in forces, only one man who is expert on the air work on that shift and he is the most reliable I ever had.

"Well, he came in slightly tee'd up and a smell of liquor on him. He kept out of my way while I was getting the others lined up who were to finish engine No. 2380. When I got to him I received a jolt. I called him into the office and I need not repeat what I said. He explained he had that day had an increase in his family and had taken a few drinks and would not have come in, had it not been that he learned of the situation regarding the specials.

"Under the circumstances, this being his first known infraction of any rules in the eight years he worked for us, I told him to lie down for a couple of hours—on the cot I use when I don't get home—and I would wake him up and see what shape he was in. This was done. He woke up quite fresh and eager to make amends; he did a first rate job, and the train went out and right on time. He was not paid for the two hours lost time and that is my story, sir."

Curtain Drops

I shall leave this right here, giving your readers an opportunity to say what they would have done had they been the S.M.P.

Bill Brown's Friend.

Machine Tool Show—A Panorama of Progress

THE 400 railroad men—executive and supervising representatives of 62 American railroads—who visited the Machine Tool Show at Cleveland were privileged to view one of the most remarkable expositions of mechanical progress ever held. Between the time that the Show was opened at the Cleveland Public Auditorium on September 11 and its closing on September 21 over 50,000 persons were admitted to the 5½-acre exhibition space with its 250 exhibits of machine tools, small tools, accessories and shop equipment. The 1935 show, the first in six years, not only surpassed anything of its kind previously held in the number and variety of exhibits, but also placed on public view the fruits of six years of intensive engineering development in the machine tool industry which has culminated in the production of machine tools and accessories so far superior to most of the equipment now in service that comparisons are extremely difficult to make.

It is impossible adequately to interpret this show to our railroad readers. There were, of course, many exhibits that were not of direct interest to railroad men except that they may have served to show the way to new processes which may eventually be introduced into the railroad field. The facts which stood out most prominently when viewing the progress in machine tool design as indicated by the show as a whole are that, regardless of the type of machine in which one may be interested, the builders have incorporated the greater strength and rigidity necessary to permit the use of the new cutting tools developed during the last few years; these new cutting materials have made it possible to secure production heretofore considered impossible with a precision and quality of finish equal to any requirements; greater machine service life and lower maintenance costs have been built into machines by the increasing use of anti-friction bearings and highly developed lubrication systems, and, in order to make it possible for the operator to secure maximum output from these modern machines, the development of mechanical and electrical controls has progressed to a point where even with the largest machine tools it is now possible for an operator practically to control every movement of the machine from a single position.

It was explained by one machine-tool engineer that for some time efforts to improve machine-tool operations were concentrated upon the problem of reducing the actual machining time. It was not long before the accomplishments in this direction made it possible to reduce machining time through the use of higher cutting speeds with more efficient cutting tools and the introduction of greater machine power to a point where the machining time on a given operation was considerably less than the time required to set up the work and make tool changes between operations. Most of the machines at the show evidenced the fact that the concentration of engineering effort on the part of the builders has recently been turned to a reduction in handling time, with the result that through the use of pneumatic, mechanical, hydraulic and electrical devices the machine-handling time has been greatly reduced.

On those tools in which railroad men are primarily interested this phase of machine-tool development was best exemplified in the planers and planer-type milling machines, the radial drills, the engine and turret lathes, and the milling and boring machines. Outstanding examples of the extent to which control of machine-tool operations has been carried out are those, such as a large milling machine, in which all operations involved in the actual handling of the machine are controlled from a single small switchboard at the operator's station and, in the case of a turret lathe, on which refinement of control has been carried to a point where the machine is actually one operation while it is being prepared for the next operation this being accomplished by a pre-selector head in which speed changes can be lined up while the machine is in operation. While one cutting operation is in progress the operator merely moves a cylinder, on which operation numbers are set up, to the next number in a sequence and, when the operation is completed, the rapid movement of a single lever immediately starts the machine going on the next operation.

Those in the railroad industry who may have felt that the shaper and the planer were gradually being pushed into the background were forced to revise their opinion when they saw what has been done to modernize these two types of machines so well-known in railroad

Railroads Which Sent Representatives to the Machine Tool Show

Aliquippa & Southern
Ann Arbor
Atchison, Topeka & Santa Fe
Baltimore & Ohio
Belt Railway of Chicago
Bessemer & Lake Erie
Boston & Maine
Canadian Pacific
Central of Georgia
Chesapeake & Ohio
Chicago & Eastern Illinois
Chicago & North Western
Chicago, Burlington & Quincy
Chicago Great Western
Chicago, Indianapolis & Louisville (Monon)
Chicago, Milwaukee, St. Paul & Pacific
Chicago, Rock Island & Pacific
Chicago, St. Paul, Minneapolis & Omaha
Cleveland, Cincinnati, Chicago & St. Louis
Cumberland & Pennsylvania
Delaware & Hudson
Delaware, Lackawanna & Western
Detroit, Toledo & Ironton
Elgin, Joliet & Eastern
Erie
Great Northern
Grand Trunk Western
Green Bay & Western
Illinois Central
Illinois Northern
Kansas City Southern
Lake Superior & Ishpeming
Lake Terminal
Lehigh Valley
Louisville & Nashville
Maine Central
Michigan Central
Midland Terminal
Missouri-Kansas-Texas
Missouri Pacific
Monongehela
Nashville, Chattanooga & St. Louis
New York Central
New York, Chicago & St. Louis
New York, New Haven & Hartford
Norfolk & Western
Norfolk Southern
Pennsylvania
Pere Marquette
Pittsburgh & Lake Erie
Pittsburgh, Shawmut & Northern
Reading
Richmond, Fredericksburg & Potomac
St. Louis-San Francisco
St. Louis Southwestern
South Buffalo
Southern
Toledo, Peoria & Western
Toledo Terminal
Union Pacific
Wabash
Wheeling & Lake Erie

work. The application of new controls and new fixtures has made possible production on these types of machines which bids fair to keep them in the picture for some time to come. Among the unusual things seen in the field of planer design was a new type of machine which cuts in both directions, thereby opening up new possibilities in the field of planer work.

That the surface of possibilities in the use of grinding for railroad finishing operations has only been touched is indicated by many of the grinding machines seen at the show. Not only have these machines been adapted to many new types of work, but the development in grinding wheels and fixtures has made it possible to produce finishes on parts which will contribute to longer life of many locomotive parts with a consequent reduction in the cost of maintenance. In the field of milling machines, both large and small, the combined development of easily controlled machines, greater power, more efficient cutting tools, and ingenious fixtures has shown the way to the reduction in cost on many locomotive machining operations to a point far below that which is now common to the average railroad shop. One of the interesting exhibits, from a railroad standpoint, was a modern milling machine working on shoes and wedges which actually produced, during the progress of the show over 300 wedges for use on a large eastern railroad.

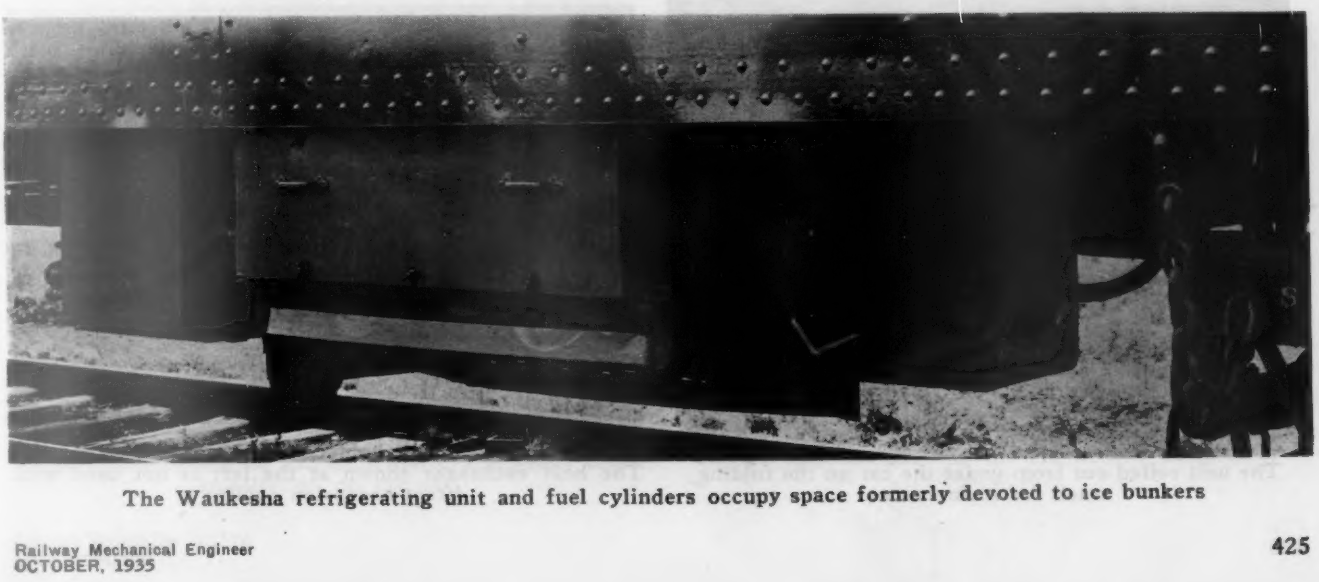
A Self-Propelled Air-Conditioning System

Unique gas-engine-driven compressor unit, thermostatically controlled, replaces ice on a Chicago & North Western coach

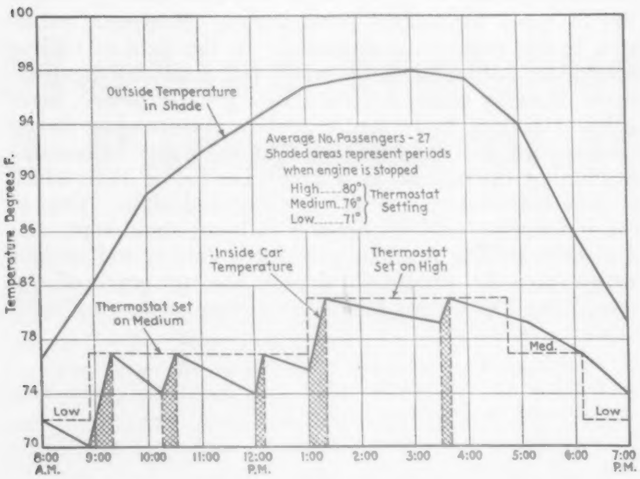
WORKING in co-operation with the Chicago & North Western car department, the Waukesha Motor Company, Waukesha, Wis., has developed a complete engine-driven refrigerating unit for air-conditioning service using bottled propane gas for fuel. This unit, which is thermostatically controlled just as are electrically driven compressors, has been in operation on C. & N. W. coach No. 6110 since June. Its fuel cost is low, and the engine-compressor unit operates smoothly and quietly and without objectionable fumes from the engine exhaust.

Like the ice-cooled system, this mechanical unit does not require steam or electricity generated by the locomotive for its operation, and, as its total weight ready for service is but 2,850 lb. complete, a net saving in the required tractive force to handle the train is effected. Within this weight and the space formerly occupied by the two ice bunkers on Coach 6110 is a complete independent engine-driven compressor and condenser unit with fuel supply sufficient to last from three to five days without refueling. The entire mechanism is built on a structural-steel chassis and mounted on pneumatic tires which are supported by channel-iron brackets secured to the underframe of the car so that vibration and noise cannot be transmitted to the occupants of the car. Flexible refrigerating and fuel lines permit withdrawal of the unit on extensions of the mounting rails for convenience in servicing and inspection. The entire unit can be quickly replaced without taking the car out of service. Tests so far show that fuel cost has averaged one dollar per 1,000 car-miles; less on fast runs than on the slower runs.

In developing an engine-driven refrigerating unit, a number of basic considerations were set up as conditions for a satisfactory design. In the order of their importance, it was felt that (1) it must not impose an additional load upon the locomotive, sometimes already overloaded, either for steam or electric power generation; (2) it must be economical to operate and maintain—cheaper in operation than existing systems; (3) it must be applicable to existing equipment with no major



The Waukesha refrigerating unit and fuel cylinders occupy space formerly devoted to ice bunkers



Typical performance of coach No. 6110 equipped with the Waukesha air-conditioning engine and compressor controlled by vapor thermostat

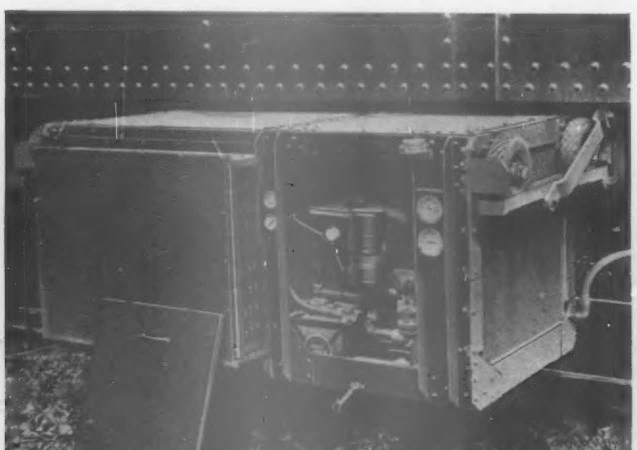
changes; (4) it must be simple, compact and safe; (5) it must have adequate capacity to meet the most severe weather conditions for long periods at a time; (6) it must not require time en route for recharging or routine servicing; (7) it must be instantly available for use regardless of car location—not dependent upon car movement and entirely independent of battery power; (8) it must be fully automatic in operation and responsive to thermostatic control; (9) it must be clean, quiet and smooth in operation.

The introduction of bottled propane gas, and its wide commercial distribution by the petroleum refineries has made it at once practical and economical to consider an engine-driven unit. Propane has the high heat value of 21,600 B.t.u. per lb. and one gallon weighs 4.2 lb. It is liquefied at moderate pressures and temperatures, but at atmospheric pressures gasifies readily. Shipped in tank cars as a liquid, the pressure at 70 deg. F. is 125 lb. per sq. in. In Texas and Oklahoma where it has already found a large market and is distributed by practically all the oil refineries, its quoted price is three cents per gallon in car lots, f.o.b. the refinery. Propane has nation-wide distribution. It thus affords a potential power which, based on its heat value, is even cheaper than Diesel fuels. Because of its prompt evaporation, it is safe to handle as no puddles of the liquid can form. It is an ideal fuel for internal-combustion engines because it has high anti-knock characteristics, with an octane rating of 125, forms a true and perfect gas mixture without adjustment, requires no choking for starting, and produces no crankcase dilution. It burns without smoke and does not exhaust noxious or poisonous gases.

With the proper fuel available, the selection of the Waukesha heavy-duty industrial engine as a basis for the design was adopted. This engine has been modified to increase its compression ratio to 9:1 so that the operation of the engine on propane gas is extremely economical. This solved the power problem most satisfactorily as each car has its own individual self-generating power unit. The locomotive is thus relieved of all additional burden and, in fact, the dead load is reduced as the weight of the complete unit is under 3,000 lb. per car, and the equipment which it replaces is generally much heavier. The engine is connected by a three-shoe expanding clutch operated by inertia to a four-cylinder vee-type refrigerant compressor which is driven by multiple V-belts. Secured to the compressor housing on either side are large tubular condensers, air-cooled, while the forward end of the compartment is opened to admit air which is drawn in by a large propeller-type fan. Heavy grilles protect the fan openings as well as the condensers from mechanical damage.

The entire unit falls well within the limits of conventional ice bunkers. Its overall length is 72 in., its height 31½ in. and its width 39 in. The unit in the chassis weighs 1,650 lb. Balancing the unit on the opposite side of the car in the place occupied by the ice bunkers is the fuel-receiver holder and rack, the weight of which with three loaded receivers is 600 lb. The fuel section is considerably smaller with a length of 54 in., width of 44 in., and a maximum height of 32 in. The installation on existing ice-cooled cars requires only the removal of the ice bunkers and the installation of the hangers for the compressor unit and the fuel receiver on the opposite side.

Within the car, the circulating water system may remain unchanged if a heat exchanger is mounted beneath the car on the same side as the fuel-receiver rack and the water circulated in the conventional manner. The modern direct-expansion system can be applied if desired with almost equal facility, and provides more efficient operation by substituting the refrigerant itself for the water in the car-cooling coil and operating with direct expansion in the coil. The North Western trials were conducted with the installation made both ways to compare the relative efficiencies.



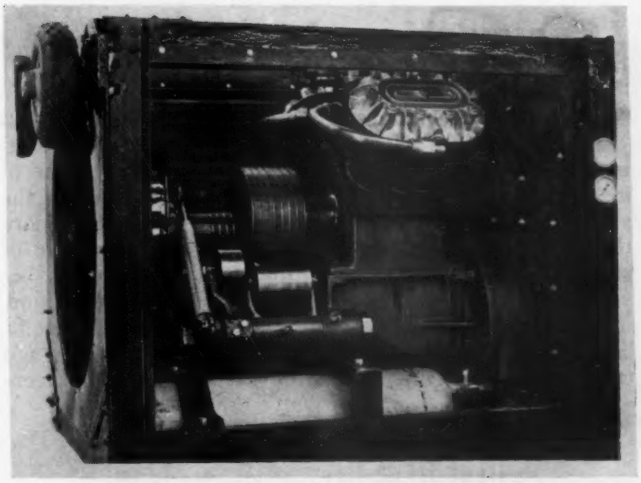
The unit rolled out from under the car on the folding track for maintenance

The fuel cylinders and holder with the covers removed—The heat exchanger shown at the left is not used with direct-expansion cooling

In selecting the proper size of units, it was felt that by relieving the locomotive of the power requirements, the only limitation to adequate capacity was the maximum requirements developed by experience. A unit with seven tons capacity was selected and the engine itself was picked so that additional power would be available for special operating requirements without change. The demand upon this engine is less than half of its maximum capacity, and normal operating speed is likewise much below the speed at which this engine is usually applied. It is a four-cylinder unit with a bore of 3 in. and a stroke of 4 in., and develops 18 hp. on propane gas at 1,000 r.p.m. It is equipped with its own six-volt electrical system for starting and ignition. It has full automatic pressure lubrication and is started and stopped automatically by the thermostats within the car. Safety controls stop the unit automatically if the engine overheats either from oil or water failure, and they likewise permit cranking only for a limited period in the event the fuel supply is exhausted. The Ensign gas carburetor is a simple mixing valve which has fixed jets without any adjustments. A large oil-type air cleaner is used which protects the intake from dust and increases the life of the engine. The lubricating oil is carried in the engine base which holds a supply adequate for a thousand hours of continuous operation. The fuel system, when fully charged, will operate the engine continuously at maximum capacity for 60 hr., but, as the normal cycle requires operation only a part of the time, this is equivalent to greater number of days of duty on one fueling. Thus, no time en route is required for recharging or servicing, and the unit is always available for full-capacity operation as long as there is fuel remaining in the receivers.

Special means have been taken to prevent the transmission of vibration from the unit into the car. A unique suspension has been developed which carries the entire weight of the engine-driven unit and chassis on four industrial-type pneumatic tires. These tires and their roller-bearing wheels serve the double purpose of insulating the unit from the car body and facilitating its withdrawal from under the car for inspection and servicing. It has been found, in practice, that even with the car standing in the terminal, it is hardly possible to detect whether the unit is in operation or not. Observers who have conducted the tests on this unit were required to depend upon a single light at the control cabinet for this purpose. With the use of propane and its complete, clean burning, it is said to be difficult for an observer standing beside the unit to tell whether or not it is in operation. The engine compartment is insulated by the Burgess method of sound absorption.

The following is a summary of the fuel cost in operating the Waukesha engine-driven refrigerating unit on



The compressor and fan are belt-driven from the transmission

Chicago & North Western car No. 6110. These tests, as well as the installation of the equipment, were under the direct supervision of W. E. Dunham, superintendent of the car department.

MENOMINEE RUN, TRAIN NO. 209 AND 210 (DURING JUNE, 1935)

Total miles run during test period	5,280
Total miles between Chicago and Menominee	264
Running time between terminals	7 hr. 10 min.
Total fuel (propane) used in lb.	343¼
Total fuel (propane) used in gal.	81
Lb. of fuel (propane) per 1,000 car-miles	65
Gal. of fuel (proparte) per 1,000 car-miles	15.3

Note—Outside temperature for June ranged between 69 and 84 deg. F. Propane costs $0.055 a gal. delivered in Chicago; hence: $0.055 × 15.3 = $0.87, cost of propane per 1,000 car-miles.

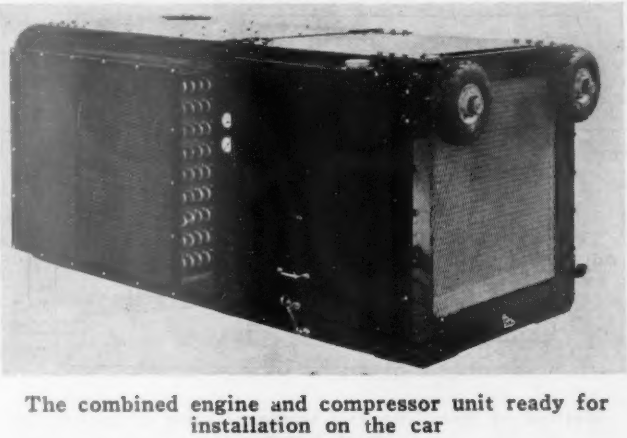
RAPID CITY RUN, TRAIN NO. 411 AND 412 (DURING JULY AND AUGUST, 1935)

Total miles run during test period	6,946
Total miles between Chicago and Rapid City, S. D.	940
Running time between terminals	10 hr.
Total fuel (propane) used in lb.	820
Total fuel (propane) used in gal.	193
Lb. of fuel (propane) per 1,000 car-miles	118
Gal. of fuel (propane) per 1,000 car-miles	27.9

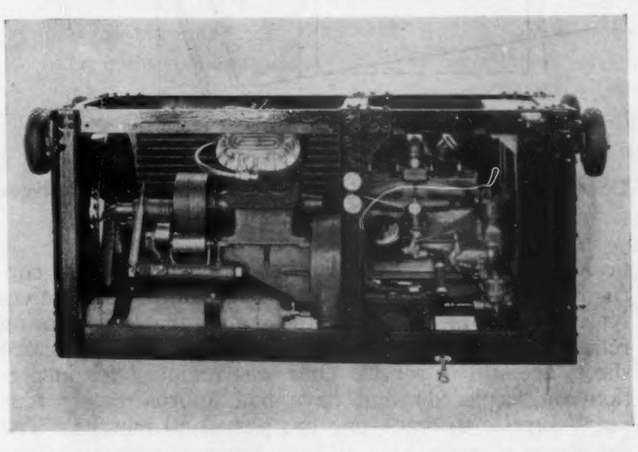
Note—Outside temperature ranged between 77 and 98 deg. F., as indicated on the performance curve shown in one of the illustrations. Propane costs $0.055 a gal. delivered in Chicago; hence: $0.055 × 27.9 = $1.53, cost of propane per 1,000 car-miles.

About one quart of lubricating oil is required for each 1,000 miles of car travel.

An interesting side light on the test occurred July 28, four miles east of Rochester, Minn., where the train was delayed for six hours by a washout. All battery-driven equipment had to be operated at reduced capacity so that the ice-activated cars would not run short of ice while the engine unit on car No. 6110 furnished cooling for the entire six hours.



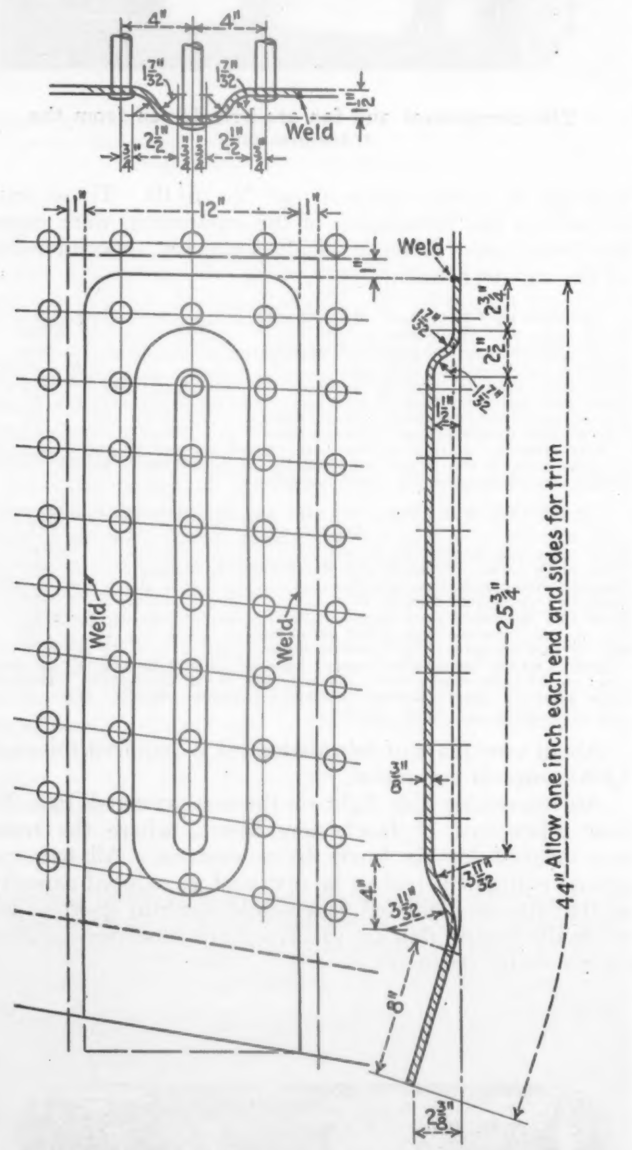
The combined engine and compressor unit ready for installation on the car



Covers removed showing the engine and compressor compartments

Corrugations Increase Life of Firebox Sheets

THE greatest amount of expansion in a firebox comes at a location where the temperature is highest and increases with the length of the sheets. The point of maximum expansion is in the side sheets under the arch. Here the horizontal length under the arch is more than three times the vertical height. The short life of such side sheets proves that the expansion here is beyond the fatigue limit of the steel. The Boston & Maine, in order to take care of this expansion in a 100-sq.ft. box without exceeding the elastic limit, a few years ago tried the experiment of pressing in the sheet three vertical corrugations, as shown in the sketch. These corrugated sides were installed on one side of locomotives Nos. 4013, 4014 and 4016, the regular flat sheets being retained on the other side. All of these corrugated sheets are still in service (one was removed for inspection and replaced) and have had approximately four years' service to date—one has passed 50 months. The flat sheets opposite have all been renewed once and some twice. From this experience it will be noted that the first three experimental installations have to date more than doubled the life of these locomotive side sheets.



Corrugated strip in side sheets of B. & M. locomotives with large fireboxes

These corrugations may be pressed singly and the patches then welded in the box if it is not convenient to press the side sheet itself. The only difference is one of relative cost.

Feedwater Heat Booster

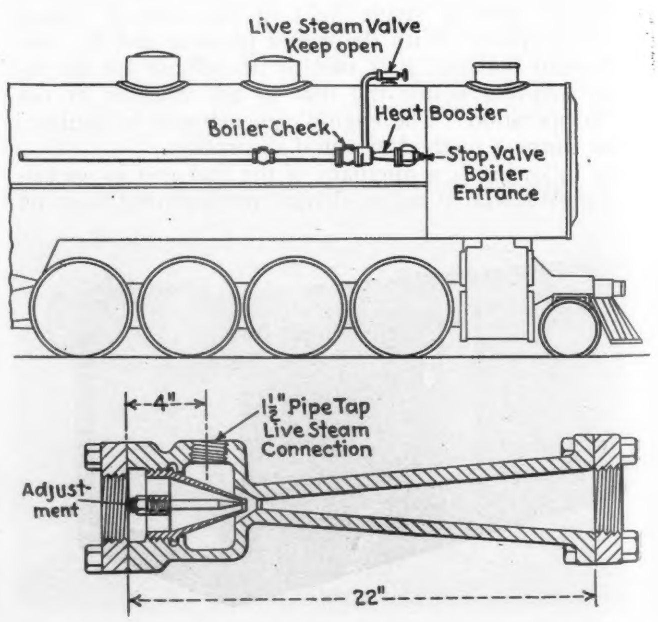
THE Wilson Engineering Corporation, Chicago, has recently placed on the market a heat booster which is now in service on several feedwater-heater-equipped locomotives. The purpose of this device is to prevent the possibility of delivering cold water to the boiler under any condition. It also eliminates the necessity of issuing instructions to the engine crew in regard to this possibility.

The device raises the temperature of entering feedwater approximately 100 deg. F. regardless of tank or branch-pipe temperature. It also appears to have solved the difficulty in foaming water districts where the use of the injector has been found necessary to emulsify the anti-foaming compound used, thus making the feedwater heater continuously available.

In operation the device primes itself as soon as the feedwater pump starts delivery. The pump is "unloaded" at from 5 lb. to 10 lb. pressure by the kinetic energy of the induced live steam.

Tests have shown that the device raises the feedwater temperature approximately 100 deg. F. This temperature is maintained throughout the range of the temperature of the feedwater which is from 50 deg. to 210 deg. F. Thus, if the pump delivery temperature is 200 deg. F., this device raises the temperature to 300 deg. F. before it enters the boiler. No change in the thermal efficiency, plus or minus, is expected or obtained.

The device is installed anywhere in the branch pipe ahead of the line check or, as shown in the illustration, between the boiler check and the stop valve. It can be quickly and easily installed in the enginehouse.



Method of installing and sectional view of feedwater heat booster

EDITORIALS

Fuel Economy Bulletins

One of the most interesting fuel economy bulletins presented at the recent meeting of the International Railway Fuel Association at Chicago pertained to the use of locomotive fuel at engine terminals and stressed the possibilities of economy by more careful handling of this fuel. The bulletin stated that approximately one scoop out of eight of locomotive coal is burned on the locomotive while in charge of engine terminal forces; and that correct standard practices for building and preparing fires, cleaning fires, banking fires and dumping fires should be developed and strictly adhered to. Engine-terminal supervisors who make sure that correct practices are followed in these particulars will contribute substantially to over-all fuel economy. The bulletin stated that this saving might amount to as much as 5 per cent of the present consumption of coal at engine terminals on the road in question, or a saving of about $50,000.

The upper part of the bulletin was devoted to a diagram which carried the challenge "Help Save Coal" and gave the relative standings of various divisions as regards fuel performance, showing the unit fuel saving, as well as the value of coal saved, on each division. The names of the divisions which were unsuccessful in saving coal were not included on the honor roll, a very significant omission which will doubtless prove helpful in stimulating more intensive fuel saving efforts on the divisions which have apparently become lax and permitted wasteful fuel practices to develop.

By What Authority Do They Speak?

Bert M. Jewell, president of the Railway Employees' Department of the American Federation of Labor, is reported in the newspapers to have stated in an address before the Brotherhood of Railway Carmen of America in Montreal, that the so-called standard railroad unions were advocating the nationalization of railroads in the United States.

Advocate Government Ownership

On June 20 of this year the Association of Railway Labor Executives adopted resolutions favoring the immediate taking over of the railways of the United States by the federal government and the creation of agencies within the federal government to manage and operate the railways. Of the twenty-one associations represented in this organization, two voted against the resolution—the Brotherhood of Locomotive Engineers and the Switchmen's Union of North America.

What right have the labor union leaders to commit their organizations to so radical a program without first getting some expression and approval from the members? We know and come in contact with many members of these organizations, but it is unusual to find one who favors government ownership of railways. From whom have the labor leaders received their instructions or mandate? Apparently they are going ahead on their own initiative. Will the members of the unions stand for such high-handed procedure?

Collective Bargaining and Politics

We hear much about collective bargaining and its importance. To a large extent it has been approved of by the railways of this country for many decades. It is generally recognized that some form of collective bargaining is essential under modern conditions, although it is deeply to be regretted that too frequently quarrels between the managements and the workers are being dragged into politics by the labor union leaders, with bad results. The unions are organized for the purpose of bargaining with the employers, but judging from recent happenings labor leaders are in many instances passing up even the formal appearance of dealing with the railroad executives and are taking their demands direct to Washington and to the politicians. Do the unions, which have so long contended for the right to "bargain collectively," now wish to renounce that right and seek their ends entirely by political means?

In collective bargaining there is an element of give and take on both sides and some attempt to settle questions on a basis of justice. In politics, right and wrong have little weight; the decision goes to the side which can muster the most votes in Congress. Perhaps the labor leaders think they can gain more by politics now—but maybe, sometime, the political situation may change. There is no guarantee that future Congresses will be as friendly to organized labor as this one has. Under such circumstances retention of collective bargaining would be a bulwark of protection for the unions.

But just establish the precedent of running to Congress for everything, and collective bargaining will die—and probably will stay dead. To a certain extent

Congress and the Administration have apparently approved of this procedure—at least they have stood for it. The pickings have been so easy for the labor union leaders that they apparently feel that they will sit even prettier if the railroads are taken over by the government. This is perhaps to be expected on the basis of recent past performances. The labor union leaders do not realize that the private managements stand as a buffer between them and the demands for lower rates. Remove these managements and railway labor would have to bear the full responsibility for railway rates. After all, there are a lot more votes in this country which want low railway rates than there are votes which demand high railway wages. Let the public once understand this, as they certainly would under government ownership, and—collective bargaining being dead—it is easy to predict what would happen to wages.

Pitting Labor Against Capital

A group of men from industry studying how to improve human relations, recently came to the conclusion, after several days of conference, that the Administration at Washington was more or less intent on arraying labor and capital against each other. This is most unfortunate; there is a question as to whether any industry can succeed or function effectively and efficiently in the public interest under such conditions. We hold no brief for or against labor unions, but we submit that they must play the game in the public interest, which, in the last analysis, is their own selfish interest, just as we expect railway and industrial executives to be governed by similar ideals.

The possibility of government ownership of the railroads has been studied and debated in this country for many years. The public is obviously not interested in the question; in fact, it is quite apparently opposed to government operation of the railways. This decision is based on experiences during and following the World War, on the comparison of railroad results in this country with those of other countries, and on many studies by various and independent groups of researchers. Only a disaster or a crisis which would leave no other recourse open would warrant making such a change.

Co-ordinator Eastman's Position

Co-ordinator Eastman has been regarded as an advocate of government ownership of the railroads. In a report transmitted by the Co-ordinator to Congress and the President, made public January 30, 1935, the advantages and disadvantages of government ownership were presented and the conclusion was drawn that "under present conditions particularly, it would be essential to its [government ownership of railways] successful operation, that the public trustees be given an absolutely free hand. Only an enlightened and sustained force of public opinion could accomplish this result, and the Co-ordinator has as yet seen no evidence of such public opinion. It would be dangerous to take so far-reaching a step until the country is prepared to welcome it and to lend it the support and protection essential to its success."

Mr. Eastman surely cannot be accused of being partial to private ownership. As a matter of fact, in introducing the list of disadvantages of government ownership, we find him making this statement: "The Co-ordinator believes, for the reasons given in his first report, that the ordinary and grosser dangers commonly believed to be attendant upon government ownership and operation could be avoided, but that there are certain special dangers under present abnormal conditions."

What Do Labor Union Members Say?

In other words, the Co-ordinator passes lightly over the objections which have been urged against government ownership by thoughtful students and observers of this problem. He does feel, however, that there are certain disadvantages now existing which far offset any advantages to be gained from government ownership.

We commend a reading and study of his report to the railroad labor leaders, who apparently on their own initiative and without authority or mandate from the members of their organizations, are advocating the immediate taking over of the railways. What have the men in the ranks to say about this misleadership?

Mechanical Associations Deserve Support

There are, or formerly used to be, a total of ten associations of minor mechanical department supervisors. One dropped by the wayside quite a number of years ago, and another was absorbed and finally discontinued about four years ago. Of the eight remaining, only four held annual meetings this year and only two of the meetings held were at all well attended. If the objective of railway managements is to permit these associations to lapse and gradually pass out of the picture, this objective would seem in a fair way to be accomplished.

It is more likely, however, that the present keen urge for reduced expenses, coupled with a desire to see which of the associations have some real vitality and "reason for being," has led managements to display a rather non-committal attitude and say that the associations may hold business meetings, but there must be no attendant expense to the railroads. In view of this attitude, much credit should be given to the four associations of fuel men, traveling engineers, general foremen and master boilermakers which held meetings in September at Chicago, as described elsewhere in this issue. The total registration of about 125 members at the International Railway Fuel Association meeting and an equal number at the Master Boiler Makers' Association meeting is especially commendable because by far a great majority of the men came on their own

time and at their own expense to secure information which is of primary benefit to the railroads they serve.

In may be admitted that the associations of mechanical department supervisors have been guilty of a certain amount of duplication of effort, some misguided effort, and, all too often, relatively weak programs, with no action taken to summarize and make generally available the conclusions from such worth-while reports as were presented. In spite of the deficiencies mentioned, all of which can be overcome, the idea behind the mechanical department supervisors' associations is a good one. It can hardly be questioned that, almost without exception, these associations possess potential capacity to improve the knowledge and experience of individual members and thus promote more efficient railroading.

The cue for all of the associations which are not completely discouraged, and still feel that they play a real part in the railroad program, is to redouble their activities during the coming year and miss no opportunity to inform their superior officers, not only regarding the good work which has been done in the past, but also regarding the work and objectives planned for the future. Steam railroad transportation is a business second only to agriculture in magnitude and the ground of possible improvement in operation and maintenance methods has hardly more than been scratched. It should be plowed deep. Any group or groups of railway supervisors who can help to this end by making a real contribution to better railroading will deserve and unquestionably will receive the support of higher railway officers responsible for transportation results.

Is the Cart Before the Horse?

The Federal Co-ordinator's Section of Transportation Service has issued a report on types of motive-power equipment proposed for use in container power cars. This is in the nature of an appendix to that portion of the freight-traffic report which deals with co-ordination of rail and highway traffic. Manufacturers of various types of motive-power equipment for use as locomotives or for installation in power cars were asked to submit designs utilizing appliances already in commercial use here or abroad to meet the following general specifications: (1) Speeds of 60 m.p.h. on straight, level track with two or more trailers in trains of gross trailing loads as high as 500 tons; (2) double-truck container power car with a clear platform space back of the engineroom and cab or between the enginerooms and cabs, varying in length for the loading of two, three, four or five containers.

The report contains an interesting collection of proposals for steam power plants and gasoline and Diesel engines with electric, mechanical or hydraulic transmissions, some embodied in separate locomotives and others fitted on flat cars for the direct handling of containers. Some of the locomotives are types which are already familiar to the railroads; others are known to have been under development for some time, although they have not yet been in practical service.

While it may be that some of these applications are incapable of ultimate practicable development, it is reasonable to assume that at the present state of motive-power developments no inherent difficulty need be expected in the building of power units to meet the specifications laid down by the co-ordinator. The real question to be asked, however, is what place in the scheme of rail transportation freight motor cars may be expected to take. To what extent can the railways regain lost freight traffic by the use of frequent light trains consisting of a container power car, with or without a few trailers? Can this method of operation alone, superimposed upon present mass transportation methods of operation and without a complete change in freight classification and tariffs, be made economically practicable? With the types of motive power already well established, to which no doubt others are yet to be added, the method of motive-power application and the size of unit can be adapted to the needs of the traffic. But first it must be determined what changes, if any, in principles and methods of operation are economically desirable.

NEW BOOKS

The Mechanics of a Locomotive on Curved Track. *By S. R. M. Porter. Published by The Railway Gazette, London, England. Paper bound, 32 pages, 9 in. by 12 in. Price, 5 shillings.*

This paper was first published as a serial beginning in the Railway Engineer and completed in the Railway Gazette after the consolidation of the two publications. The author was educated in England and, after working for a while with the locomotive firm of Nydquist & Holm, Trollhatten, Sweden, entered the service of the London, Midland & Scottish Railway. In 1929 he was appointed assistant to Sir Henry Fowler, head of the newly formed research department. For this paper the author received the George Stephenson award of the Institution of Mechanical Engineers.

The behavior of a locomotive or a car passing around a curve at speed and the forces produced on the wheels and the track is a complicated problem in railway mechanics. The bearing on rolling-stock design, particularly for high speeds, is, however, important. If the forces become too great, the flange of the wheel will mount the rail and derailment will occur.

The paper is probably the most complete mathematical and mechanical analysis of the problem that has ever been attempted. After consideration of the forces acting on a curve and on the truck and a consideration of the slip between the tire and the rail, there are seven appendices giving calculations and analyses in detail of the problems involved.

THE READER'S PAGE

The Roundhouse Foreman's Lot

To the Editor:

I do not agree with the writer of The Roundhouse Foreman's Daily Log, nor with those taking sides with him. It is all a lot of bunk, or self pity, or trying to pat yourself on the back.

One writer states that some of those in superior authority in the mechanical department should try it, and that under the same conditions they would be nerve wracked flops in two weeks; this is all bunk. Our superiors have all passed through the mill and that is the reason that they are our superior officers. I personally have seen some of them as they were going through the mill and know that they had their troubles also.

I have no complaint to make, as work is my hobby, and the more of it, the better I feel. I have quite a little charge myself, as I am the enginehouse foreman, car foreman, wrecking foreman and no assistant, as well as storekeeper, timekeeper and do my own clerical work. I find time to take active part in church work, as well as to do a lot of work around home. I also find time to be one of the leaders in our six-team church soft ball league and to help my children with school work and many other things in my community, and thankful for it all.

Tooting my own horn some more, I am also now on my eleventh straight continuous years of no personal injuries to any employees working under my supervision, and I have the good will and respect of all my superiors as well as the ones who are under my supervision.

J. B. Samples.

An Economical Process

To the Editor:

Possibly the following report on some metal-spraying we did as a trial would be of interest to some readers.

We are finding many economical uses for this newer method of building up worn parts. It is not practical to use the autogenous process to build up armature-shaft bearings on account of some distortion which takes place due to the heat; therefore, in this instance we made a trial and turned the worn bearings of a 7½-hp. motor $\frac{1}{16}$ in. below the original diameter, then sprayed a high-carbon steel wire on them both. The total cost of turning, spraying and grinding was:

2 lb. high carbon steel	$0.56
36 cu. ft. oxygen	.40
38 cu. ft. acetylene gas	.90
1¾ hr. spraying	1.27½
1 hr. grinding bearings	.80
Total	$3.93½

A new shaft would cost, with application, $6.75.

This motor was run under a fair load for 558 days of 8 hours, or 4,464 hours, making 468,720,000 revolutions. We then inspected and measured the bearings and found less than .00050 wear. We believe the application of the high carbon wire spray to add much to the life of similar bearings.

It has also been found quite a practical economy to spray stainless or alloy steel on common steel water-pump piston rods.

"Sprayer."

Hose Reclamation Practice Questioned

To the Editor:

After reading carefully the article on page 397 of the September *Railway Mechanical Engineer*, entitled "Repairing Hose at Pitcairn," I cannot refrain from writing to offer certain criticisms of the methods described. For example, why are the hose tested after being removed from the cars? It seems to me that the car man who took them off must have had some good reason, and, in this case, I think much time is lost in making the test, as the hose should be considered scrap.

In the shop where I work, which mounts an average of 5,000 hose per month for a large western railroad, it is our assumption that when a hose is removed from a car it is fit only to be scrapped. When received in the shop, all hose are stripped and the blanks baled and sold. The couplings and nipples are separated, the couplings being thrown into a bin and the nipples placed near the cleaning position, where a motor-driven scratch brush, operating at a speed of 3,450 r.p.m., is used to thoroughly clean the nipples. Those with defective threads are sent to the pipe machine if suitable for rethreading. The clamps are opened on a shop-made machine close to the stripper, which restores the clamp to its original contour. Clamps having ¼-in. holes are taken to the drill press and redrilled for $\frac{5}{16}$-in. bolts, as the smaller bolt is not used on our road. The groove cleaner, referred to in the article, may do the work, but not as thoroughly as a motor-driven emery disc, which removes all dust and rust and does the job much quicker.

The article states that the hose are pushed on to the fittings by a machine, but this is not very good practice, as the hose lining may be torn. A safer method is to push the hose on by hand. The idea of using a steel ball to ascertain if the inner part of the hose is obstructed seems to be somewhat far-fetched, as the proper inspection of various hose parts before assembling, and the exercise of due care in avoiding damage to the hose lining when the coupling and nipples are applied, would seem to assure an unobstructed opening through the hose.

In conclusion, I am at a loss to understand how the Pitcairn air-brake shop "gets by" with a soap suds test which apparently shows the condition of the hose only. In testing air-brake hose, they should be completely submerged in water so that, when the air pressure is applied, any defects in the fittings, as well as the hose, will be detected. It is surprising how many sand holes will show up under a water test, also thin gasket seats.

Air-Brake Foreman.

Gleanings *from the* Editor's Mail

The mails bring many interesting and pertinent comments to the Editor's desk during the course of a month. Here are a few that have strayed in during recent weeks.

What About Ship-by-Rail Clubs?

What has become of the hundreds of Ship-by-Rail and Travel-by-Rail Clubs that were going to put the roads back on a paying basis with dispatch? Have the employees who started these clubs become reconciled to the short week and settled down on the nest, so to speak, to let competition take care of itself?

Fuel Economy and Air Pumps

In the matter of fuel economy. I am wondering if the difference in steam consumption between two 11-in. air pumps and one 8½-in. compound pump would justify scrapping the older type of pump. The necessity for compressed air mounts larger with the newer devices that are most always operated by compressed air. It might simplify matters for the stores department, also, if it could be relieved of carrying a few parts for every kind of pump and not enough of one kind for any pump.

Specialty Manufacturer Knows Best

An epidemic of steam leaks in the front ends of a certain class of locomotive was finally traced to shop-made bolts and studs, made of common steel, whereas the chrome-nickel steel bolts supplied by the manufacturers have a high elastic limit and don't yield and leak at high smokebox temperature. The fuel saving over a year's time would buy a lot of good bolts and studs. It stands to reason that the people who have specialized in the making of these parts are much better equipped to furnish them.

"Dolling Up" Passenger Coaches

The railroads might catch the public eye by a lot of painting and decorating along with air conditioning and streamlining, which suggests speed to the eyes; wouldn't the public sit up and take notice if it should see coaches painted in some of the newer colors used on automobiles and airplanes. The lighting of coaches can be improved with some new fixtures and light globes of sufficient wattage to afford a first-class reading light. A head rest on seats, clean, with the road's monogram done in appropriate colors, might help a little, too.

A Roundhouse Foreman-Philosopher

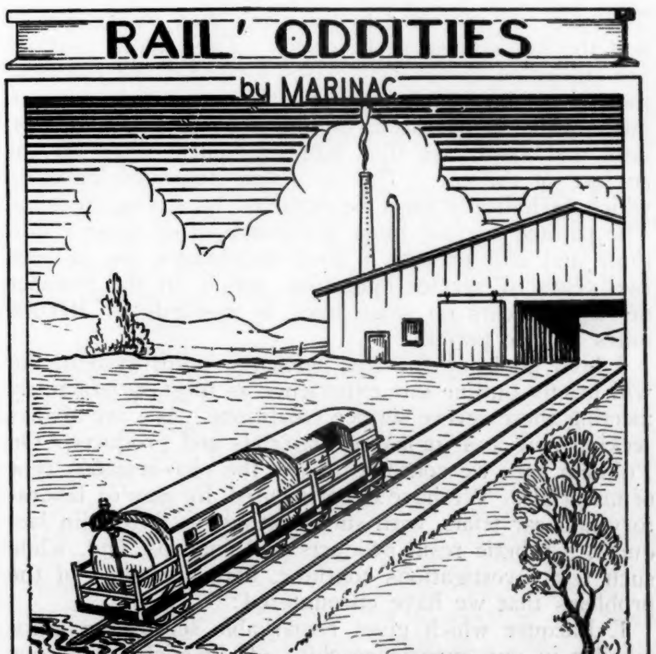
The enginehouse foreman's position was never a sinecure, and less so today where he is compelled to work with depleted forces and little or no material to make repairs. This condition has been brought about, as you know, due to the financial condition of the railroads as a whole. No matter how trying the duties of the enginehouse foreman are, it is up to him to perform those duties to the best of his ability and as cheerfully as possible; and co-operate as closely as possible with his fellow foremen, thereby lightening his duties. We all know that the managements of the railroads today are hard put to it to reduce their expenses and make as good a showing as they possibly can. We hope that this condition will not last much longer, and that a brighter future is in store for the enginehouse foreman, as well as all employees of the American railroads today.

Inspection of Trucks and Buses

The I. C. C. powers should be extended to cover the inspection and repairs of trucks and buses in the same way that the locomotive inspection rules are enforced. The gravity of the situation can be pictured by a report made of a truck which was struck by a locomotive. Questioning the driver after the accident, the conductor learned that the driver saw the engine, but his brakes were inoperative and so he decided to beat the train to the crossing. This explains the cheap truck rate. They get by for awhile, at least, spending nothing for needed repairs that would keep their vehicles in safe and suitable service.

Truck and Bus Employees

The traffic will become more evenly divided when the truck and bus employees are paid something in comparison to the standard rail wages (and not that I think the rail wages are too high, but wages in other classes are too low to measure up to the American standard). Put the trucks under the hours of service law that the trainmen are governed by and there will be an increase in truck rates to meet fair working conditions, and there will be a few less pleasure cars crowded off the highway by truckers greatly fatigued from excessive hours at the wheel. Public safety is entitled to this consideration and most anyone will agree when they see as I did, on a Sunday afternoon recently, three large trucks pulled up at the side of a transcontinental highway, the men sprawled on a blanket on the ground and their state of exhaustion such that, the shade having shifted, all were lying in the sun unmindful of the intense heat of midsummer.



Further information furnished by the editor upon request

With the

Car Foremen and Inspectors

Painting Railway Passenger Cars*

Part I

By A. M. Johnsen*

AMONG the many papers on paint in all of its various phases covered in this symposium, my subject on painting railway passenger cars, relatively speaking, covers a limited field. While railway passenger-car paint involves but a comparatively small percentage of this country's paint production, it is principally of interest from a technical standpoint. Perhaps in no other place in industry are the demands on paint quite comparable to that put on railway passenger-car coatings by reason of the service conditions in railway operation. A railway passenger car is out of doors all the year round, subject to all weather conditions. The coatings are frequently, in a brief space of time, subjected to wide ranges in climatic conditions, as for illustration in the instance of through route travel from northern points where extreme weather conditions may prevail to extreme southern points where opposite weather conditions exist. Likewise, in transcontinental service going across the hot deserts and next passing through mountain snow. The cars are subjected to the alkali dust of the deserts and the salt sprays of the ocean. The outside coatings are subjected to the acid gases formed from the locomotive smoke which envelops the cars, and, continuously while in operation, to the blasting action of cinders and sand. A dirt film gradually bakes on the surface of the car. This is a very tenacious covering which periodically must be removed by strong cleaning. The painted surface must withstand all of these conditions and still present a good appearance for at least two years of service operation, which, in the instance of sleeping cars on some lines, is upwards of 360,000 miles for the period.

I hold no brief for any particular paint system, but will briefly outline our experience as most satisfactorily meeting these severe service conditions. We are always seeking new and improved materials and products. On Pullman cars we continue to use the oleo-resinous type of materials. We have experimented, by way of laboratory and car trials, with such coatings as pyroxylin lacquers, synthetic resin products and enamels, and, while such test investigations continue, here are some of the problems that we have encountered:

1. Lacquer which gives remarkable service on automobiles in our experience chips off in spots on corner posts, vestibule ends, rivets, and projecting parts subjected to more severe contact with road ballast. Also, lettering and decorations wear off somewhat rapidly and these conditions introduce a maintenance difficulty.

2. Enamels produce very satisfactory finishes, but so far have not been found so desirable as varnish, due to the fact that they do not give the protection to lettering and decorations that we get from a clear varnish coat over the color, and a varnished surface is more easily cleaned.

3. Varnishes made with synthetic resin materials give good finishes, but so far have not demonstrated sufficient superiority to warrant general adoption, although this type of finish holds promise. This statement, however, can apply to any of the other types of finishes still in their development stage for railway service.

With these preliminary remarks, I shall proceed to describe our present Pullman standard paint practice, which no doubt is familiar to many of you.

Paint operations on a steel car commence early in its construction. All connecting and overlapping joints must be treated in order to protect later inaccessible parts from corrosion during the life of the car. For this treatment we employ chiefly a liberal application of red lead and the better grades of iron oxides. All subsequently closed-in portions of the structure are treated with an approved metal preservative paint composed mainly of lead, zinc, carbon and iron oxide pigments with pure linseed oil. This treatment adequately protects the structural interior for the life of the car. The enclosed sections, of course, do not have to weather the elements. They are, however, subject to condensation in some degree by reason of temperature difference existing between the interior and exterior of the car, although this is limited by the insulation material applied after the protective coating throughout against the inner faces of both inside and outside sheets of the wall and roof construction. After all of the exterior and interior sheets have been framed over the skeleton, the car is ready for painting.

Exterior Painting

We paint the exterior for the purpose of rust protection and in order to obtain a smooth, attractive finish. If the problem of preservation only were involved, as in the instance of many types of structures, a great deal less material and labor would naturally be involved, but we take pride in appearance and, therefore, do much preparatory work and employ good materials as the most economical in the long run. We get ten to twelve years from these exterior undercoats and from two to two and one-half years on the top finish coats. It is highly important that the initial paint treatment be such as will best serve its continued maintenance. The success of any paint treatment is predicated on proper treatment of surface and the priming coat. Ordinarily hot-rolled plates are used for the exterior surface of the car, and sanding is an effective method for its preparation for

* Abstract of a paper presented by Mr. Johnsen, who is engineer of tests, The Pullman Company, before the Philadelphia Regional meeting of the American Society for Testing Material, held March 6, 1935.

paint in the removal of mill scale, as well as foreign substances coming in contact with the surface in the shop. After the preparation the entire surface has a clean, silvery appearance with minute cavities which afford good anchorage for the paint. The rolled-steel sheets employed, while reasonably free from pits, waves and buckles, for a smooth final finish, require treatment for surface irregularities. This is taken care of with putty and paint surfacer operations and rubbed to a smooth finish. As the car painting operations simply have to fit in with the shop production schedule, the time available for painting is some 30 days. It is, therefore, clear that we do not have to resort to forced drying or baking, as the time element in painting has no economic significance with us. While it is probably true that drying coats by forced heat may improve the durability and life of railway car paint, for reasons which I will bring out later, that is contingent on other factors pertaining to subsequent maintenance. In our exterior paint schedule we show a minimum of three days drying time on the primer, although on new construction work longer time is available.

Paint Schedule—Exterior of Car

1st day—Apply one coat primer.
4th day—Apply coat of brushing surfacer.
5th day—Putty and knife in surfacer.
6th day—Rub with brick and water.
8th day—Reputty and inspect.
9th day—Sand and apply sealer color coat.
10th day—Sand and apply body color varnish.
11th day—Apply lettering, striping, etc.
12th day—Apply first coat of clear varnish.
14th day—Apply final coat of clear varnish.

It will be noted that we call for seven coats of material. This, in our experience, is about a practical minimum for the class of steel employed, and it suitably and economically fits in with our work. Two coats of surfacer are called for which are applied in order to obtain a high degree of smoothness, and on these, two coats of color are required, as the surfacer coats are highly pigmented. The first coat or sealer color coat strikes in where the remaining surfacer after being rubbed is heaviest, due to absorption by the surfacer material. From a purely protective standpoint, three of these coats—namely, the two surfacer and sealer color coats—are not necessary. The service life of the type of varnish used in railway service is about thirty months—that is, not to a point of complete destruction—but after this period we have to revarnish for sake of appearance. It is normal practice, as previously stated, to shop cars every 24 to 30 months, at which time the finish is thoroughly scrubbed, sanded and a new coat of body color varnish and two coats of clear varnish applied, and the cars are put back into service for another period of 24 to 30 months. These operations are continued for approximately 10 to 12 years, after which period the accumulation is such as to warrant a complete removal of paint film down to the steel and start all over again. From a protective standpoint, it can be readily seen that the periodical application of color and varnish gives continuous adequate protection to the steel structure.

(To be continued)

Repairing Hose at Pitcairn*

THE Pitcairn air brake repair shop takes care of the requirements for air brake and steam hose and metallic connectors for the Central Region of the Pennsylvania and the Altoona Works. Other shops performing similar work for other regions are those at Wilmington, Del., and Fort Wayne, Ind. Part I of this article covered the repair and inspection of air brake hose, and this month's installment covers steam-heat hose and metallic steam-heat connectors.

Steam-Heat Hose

The manner of handling steam-heat hose to and from the Pitcairn shop is similar to that for air-brake hose. After the hose is received at the shop it is sent to the dismantling bench, which is shown at *G* (Fig. 1). The dismantling arrangement differs from that used on air-brake hose in that the couplers are screwed off, the clamps and bolts are removed by hand, and the two nipples pulled out of the rubber hose by a machine. Ordinarily the hose is shipped, after repairs, to the outlying points minus the couplers, which are applied or removed at the point where the hose are applied. The couplers are stocked and shipped in pairs coupled together, which arrangement is necessary in order to afford proper protection. The nipples after having been removed from the rubber hose are carefully inspected, any raised portions on the sleeve ends smoothed off and rethreaded if necessary. The nipples are mounted by hand in the hose. The hose are assembled with the nipples at a bench located at *H* (Fig. 1). The hose with the nipples applied is laid on a special device which has blocks of such contour as to fit the clamps on the hose. The blocks are operated by air cylinders and close the clamps on the hose and hold them in position while the clamp bolts are being tightened.

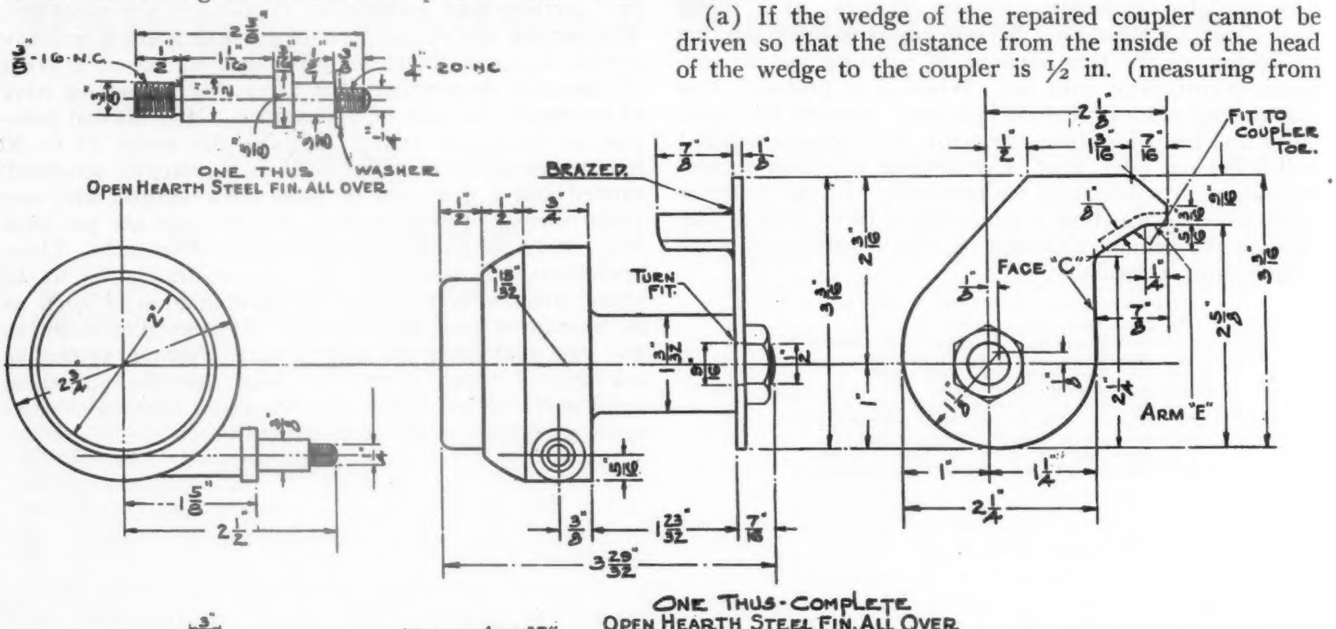
When the assembling of the nipples to the hose is completed the hose is passed over to a test bench, where an air test of 140 lb. is made and soapsuds applied to the hose and fittings. The completed hose is then placed in a rack or container for delivery to the stores department. Approximately 600 steam-heat hose are repaired and fitted up per month at Pitcairn.

Various types of steam-heat couplers are in service. The Type S-4 is used principally in passenger yards for yard steam line connections, although a few of them are applied to cars or locomotives, but only on hose. The Type 310 is used on hose only, while two other types, 312 and 825-S, are used mainly on metallic connectors. The repairs to the Type S-4 coupler consist of renewing the locking hook and gaskets, refacing the gasket seats, re-tapping threads, and the building up of the arm or toe by autogenous welding. The interlocking cam is also built up when it is necessary to do so. The gage used for checking this is shown in Fig. 10. The gage is inserted in the gasket seat hole with the face *C* lining up with the corresponding face on the coupler. If the coupling arm does not come up to the arm *E* on the gage it is necessary that it be built up. By moving the arm *F* on the gage it is then brought around to the interlocking

* This is Part II of the fifth of a series of articles dealing with repair work at the P. R. R. Pitcairn (Pa.) air brake repair shop. The fourth article appeared in the June issue. Part I, covering repair work on air brake hose, appeared in the September issue.

arm on the coupler, and if the gage arm passes over the arm on the coupler it is necessary that the coupler arm be built up.

Repairs to the Type 310 and 312 couplers are practically the same as for the S-4. The practice involved in the repairs to the Type 825-S is as follows: If the walls of the wedge housing have not been milled for shims, this is done and shims No. 1, as shown in Fig. 11, are applied. The toe or arm of the coupler to be reclaimed is built up by welding so that the distance from the center line of the gasket hole to the top of the arm is 1 in.



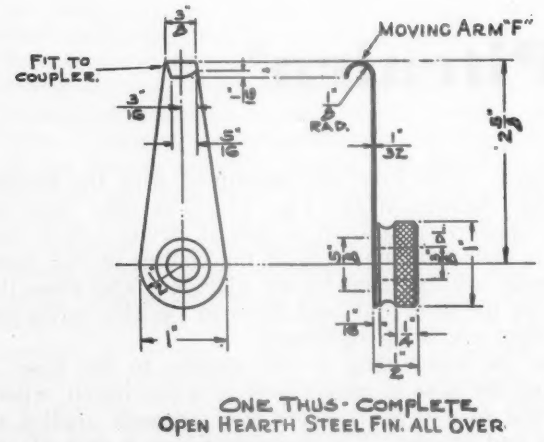


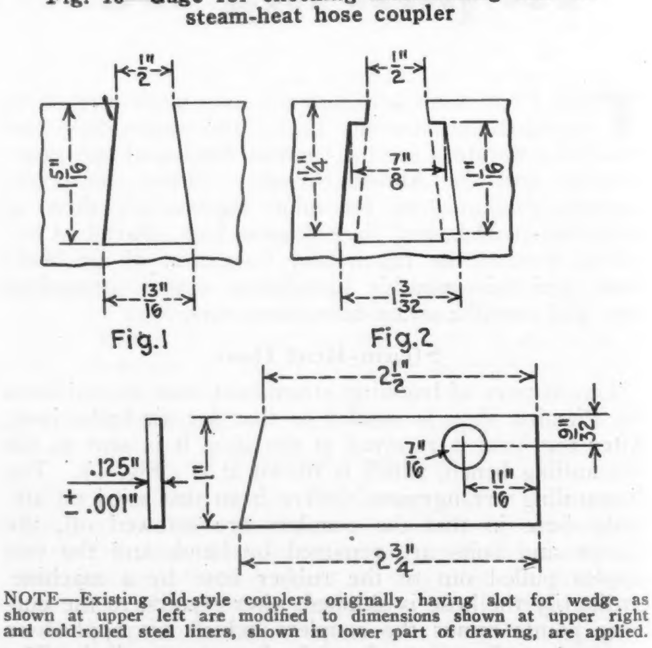
Fig. 10—Gage for checking interlocking cam on steam-heat hose coupler

The gage shown in Fig. 10 is used to check the height of the arm, as well as to ascertain the amount of wear on the interlocking arm as described in checking the Type S-4 coupler. The boss on the top of the coupler must be squared up to receive the locking hook. To prevent the spread of the wedge housing walls, they are joined at the top by welding the channel-shaped piece to the walls as shown in Fig. 12.

The gasket and gasket seat are cleaned with emery cloth. Any dents or grooves are ground out of the seats on a horizontal type grinding machine while the gaskets are lapped on a rotary lapping machine. If the gasket faces are in such condition that they cannot be ground they are machined and, if the gasket seat in the coupler warrants it, a special reamer is used to true up the surface. The combined amount of metal removed from the gasket and gasket seat is never more than $\frac{1}{16}$ in. All gaskets removed at the various repair points in the Central Region are shipped to Pitcairn for repairs. Gravity traps are examined and, if necessary, the disc or stem is renewed. In any event the trap is cleaned.

For testing couplers after repairs have been completed a gage, shown in Fig. 13, is used. This gage consists of a new Type 312 coupler on which the distance from the center line of the gasket bore to the toe is exactly $1\frac{19}{32}$ in. The coupler also has a new brass gasket applied which has had $\frac{1}{16}$ in. turned off from the face. The gage is coupled to the coupler which has been repaired and the test is made in the following manner:

(a) If the wedge of the repaired coupler cannot be driven so that the distance from the inside of the head of the wedge to the coupler is ½ in. (measuring from the inside of the coupler or the side nearest the car or tender), the coupler has sufficient draw and the test is complete.



NOTE—Existing old-style couplers originally having slot for wedge as shown at upper left are modified to dimensions shown at upper right and cold-rolled steel liners, shown in lower part of drawing, are applied.

Fig. 11—Method of applying shims to a Type 825-S coupler

(b) If the wedge head can be driven closer than ½ in., one or both shims are renewed as shown in Fig. 11.

(c) If after applying new shims the wedge can still be driven closer than ½ in., the gasket is renewed.

(d) If the wedge can still be driven closer than ½ in., the wedge is renewed.

When the necessary repairs have been completed, the coupler is tested under a steam pressure of 150 lb. and, if no leaks develop, it is laid to one side until a second coupler has been tested, when they are locked together and stocked in pairs.

The Pitcairn air-brake shop repairs an average of 500 steam-heat couplers of the various types each month.

Metallic Steam-Heat Connectors

Metallic steam-heat connectors are subjected to rigid inspection and, when defects are found that necessitate dismantling, the connector is taken from the car or locomotive tender and forwarded to a central air-brake shop, such as Pitcairn, for repairs.

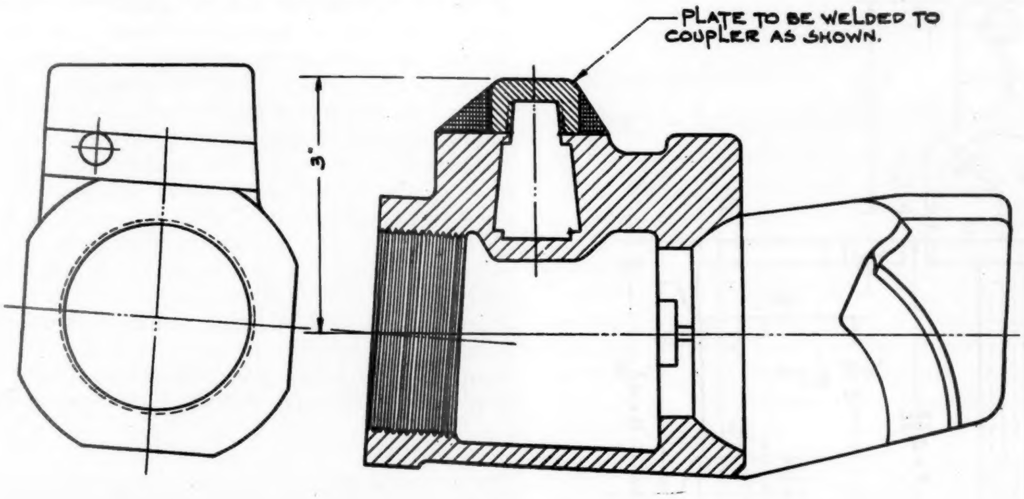
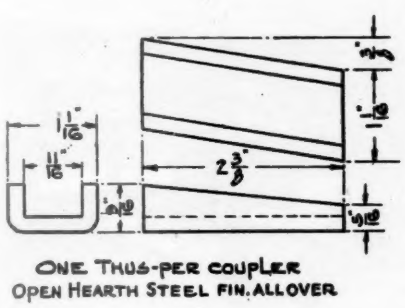


Fig. 12—Method of preventing the spread of the wedge housing walls



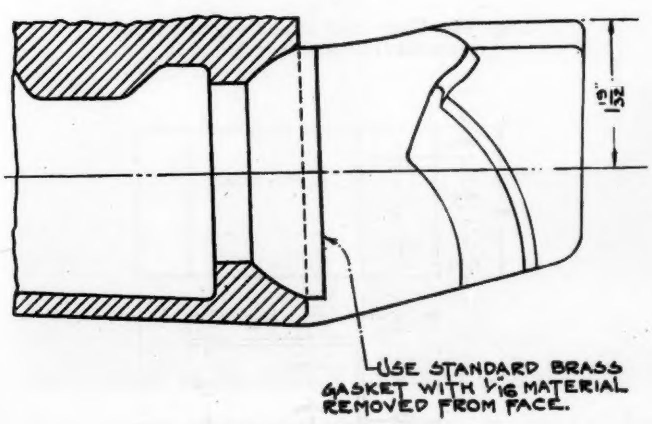


Fig. 13—Coupling test gage

Various types of connectors are used on the Pennsylvania and, in order clearly to define the practices and methods used in repairing, several types will be dealt with separately.

Metallic Connector No. 758.—The gage shown in Fig. 14 is used to check these connectors. The portion of the gage with radius *c* is placed on the vertical pipe and, if the arm (dimension *a*) does not reach the lower circumference of the straight sleeve hemisphere of the connector, the angle cup which is threaded to the lower end of the vertical pipe is pulled up on the vertical pipe to fit the gage. In order to renew the gaskets on these connectors, the socket cup nuts, the sleeve hemisphere and the ball joints are removed from the socket cups. Care is taken to remove the sleeve portion first and then the gasket and follower together. The followers and the new gaskets are replaced together in their socket cups and then the sleeve hemispheres inserted in the followers. Care must be taken to see the ball is not assembled before the follower and gasket are inserted in the socket cup. The sleeve hemispheres should be replaced in their respective socket cups and the socket nuts tightened to the registered bores in the socket cup flange, after which the cotter keys are inserted. Followers are assembled with their respective sleeve hemispheres and the socket nuts with their respective socket cups as these parts are not interchangeable. The upper straight sleeve hemisphere is inspected to see that its contour has been relieved to such an extent that it turns freely in the joint. All of the joints are well cleaned, using emery cloth in the seats of the socket cups and nuts and the hemispheres. The joints are lubricated with powdered graphite used sparingly. When reassembling, all connectors are equipped with the latest type spring suspension. When the coupler heads are applied to the horizontal pipes care is taken to have the locking device of the coupler on top in line and parallel to the flats for the wrench hold of the lower straight-sleeve hemisphere.

R. F. Type Metallic Connector.—In this type of connector care must be taken to see that the adjustable thrust bearing screws are pulled up to a position which allows the joints to move freely. Gaskets may be applied by disconnecting the joints requiring attention. There are four joints in this type of connector, two in the upper portion and two in the lower. One each of the joint gaskets in the upper and lower portions may be removed by disconnecting a flange, while the other two—one in the upper portion and one in the lower—are removed by taking out the adjustable thrust-bearing screw. In replacing the flange care must be taken to tighten the bolts and studs evenly and, in replacing the

adjustable thrust-bearing screw, it should be pulled up only to the point where the joint can still move freely. New gaskets are applied to all joints in the follower in the socket cup. If the joints which are disconnected by removing the flange previously mentioned leak after new gaskets have been inserted, the thrust bearing ring must be renewed. When the clearance between the inner ends of the thrust bearing screw and the trunnion shoulder of the vertical pipe is less than 1/16 in., the thrust bearing disc should be renewed. All parts are

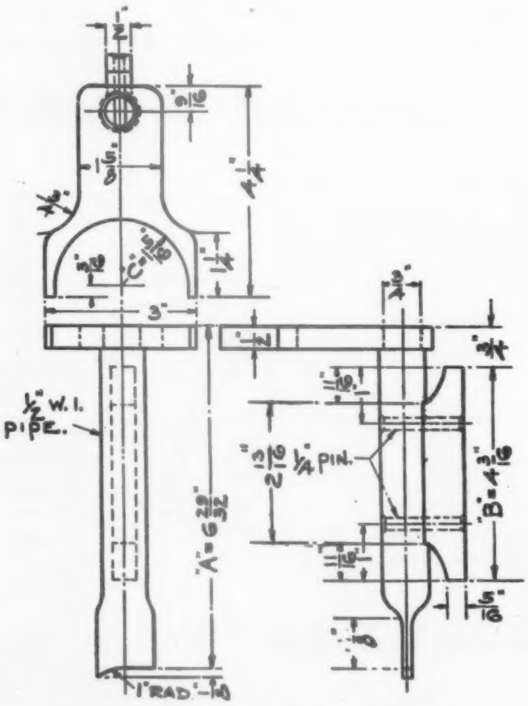


Fig. 14—Gage for checking metallic steam-heat connector No. 758

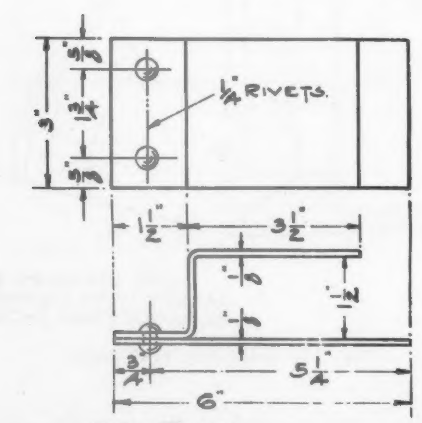


Fig. 15—Gage for springs on metallic steam-heat connector No. 768

cleaned and lubricated with powdered graphite used sparingly.

Metallic Connector No. 757.—When new gaskets are required in the joints on this style connector, the vertical tubing must be unscrewed from the lower angle casing, after which the nut may be removed from the top joint, the old gasket removed and replaced with a new one, after which the connector is reassembled. If a new gasket is required in the bottom joint, the coupler head (if applied) is removed so that the nut and old gasket can be removed and a new gasket applied. The connector is then re-assembled. Before new gaskets are applied, however, they should be wiped clean and the inside of the casing, as well as the outside surface of the ball joints, thoroughly cleaned and lubricated.

Metallic Connector No. 768.—In this type of connector the joints and retaining rings are removed after dismantling the connector. All of the bearing surfaces are cleaned and polished. The gaskets are removed and the gasket cavity cleaned out. The gasket is replaced or renewed if necessary. The spring is gaged with a gage shown in Fig. 15. If the spring is found compressed sufficiently to permit it to enter the gage, or if it has a permanent set, it should be renewed. The gaskets should be lubricated inside and out before the ferrule or follower is inserted. The heavy spring is placed in the ferrule and the complete gasket assembly applied to the recess in the connector casting, inserting the spring end of the gasket first so that the wide composition face or end of the gasket will bear against the nose of the opposing member. Lubrication is not applied to the gaskets until they are ready to be applied to the connector. A minimum clearance of 1/64 in. and a maximum of 3/64 in. must be maintained in thrust bearings. If the clearance is greater, shims 1 5/16 in. in diameter and .032 in. thick are applied under the thrust bearing to obtain the proper clearance. More than one shim may be applied if necessary. If the clamps are bent or body castings distorted, they are replaced. Care

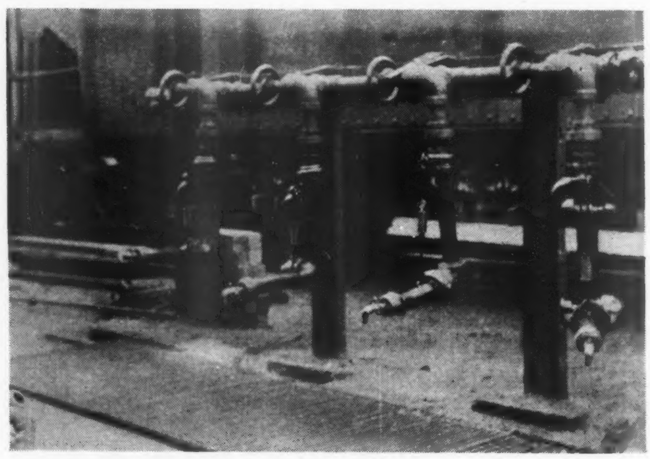


Fig. 16—Test rack for various types of metallic connectors

is taken to make sure that lock washers are applied when re-assembling connectors. Cap-screw heads are thoroughly cleaned so that they will pull down tight and grease is applied to the threads of the cap screws.

When the repairs to metallic connectors are completed, a metal tag is fastened around the vertical pipe bearing the railroad company's mark and the abbreviation indicating the shop at which the connector was repaired. Connectors are then placed on a test rack, such as that shown in Fig. 16, and subjected to a steam pressure test of 150 lb. for about two hours. During the test the connectors are flexed in all directions to insure that the joints work freely under temperature and pressure. At the completion of the test protectors are applied to the threads and the connectors are sent to the stores department. Approximately 100 metallic steam-heat connectors are repaired each month at the Pitcairn air-brake shop.

Drop Table for Streamlined Trains

THE drop-pit table, constructed by the Whiting Corporation, Harvey, Ill., and installed by the Chicago, Burlington & Quincy to handle its Zephyr lightweight high-speed Diesel-electric trains at Minneapolis, Minn., varies from the usual design produced by this company. The table can be used to drop, not alone complete trucks or their individual wheels under these articulated trains, but similar parts from under standard passenger cars and Pullmans. The table top, of the detachable type, spans a pit 18 ft. 6 in. wide in order to drop the entire power truck. Its rail girders are made

Whiting drop-pit table specially designed to drop complete trucks and single pairs of wheels from under articulated-type streamlined trains

exceptionally sturdy to sustain the weight of steam locomotives during various switching movements.

Because of the articulated car bodies being close to the rails, the width of the table top, parallel with the pit, is made 13 ft. 6 in., thereby making it possible for repairmen to work with safety on the top. As the load to be lowered, racked and raised sidewise in the pit

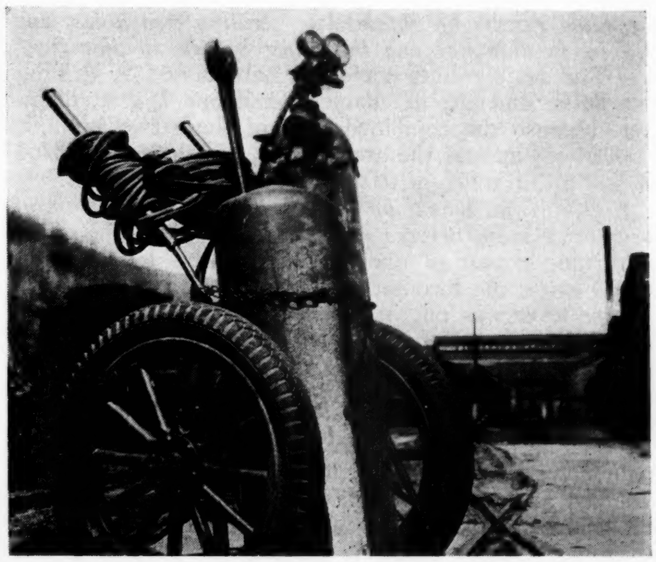
The drop-pit table in its lowered position—Table capacity 50 tons and span 18 ft. 6 in.

amounts to approximately 20 tons, a special design of understructure is used, mounted on four roller-bearing flanged wheels.

This 50-ton capacity table is electrically operated for hoisting operations and is hand racked. It has a lift of 7 in. above ground level position and is controlled through a push-button station at the end of a pendant cord. The pit, serving two tracks, is housed to protect equipment and workers from the elements. This drop table installation is of particular interest because without equipment of this kind it would be especially difficult to make wheel changes or truck repairs to modern lightweight high-speed trains embodying articulated car construction.

Portable Oxy-Acetylene Wagon

IN major car and locomotive shops oxygen and acetylene is generally piped along the tracks where cutting or stripping is to be done. However, there are many smaller repair tracks where it is necessary to use oxygen and acetylene from tanks that must be transported to the various jobs. The portable outfit shown in the illustration consists of a simple frame made from 1½-in. angles which can be either bolted, riveted or welded together and to which the tanks are attached. The frame also carries axles on which are mounted on



A convenient wagon for transporting the oxy-acetylene welding outfit

two front wheels reclaimed from a small type of automobile.

Tires that are not suitable for further use on an automobile can be utilized and, due to the small amount of mileage made with this truck, they will give service for a long period. The wagon can be easily handled by one man even across rails and other places where walkways and platforms are not maintained.

Wrenches for opening and closing the valves on the cylinders are permanently attached to the wagon and a pair of welding or cutting goggles are also carried with the outfit at all times, making it possible for any mechanic who is qualified to do this class of work to operate the welding or cutting outfit whenever necessary without leaving the repair track in search of such items.

In the
Back Shop and Enginehouse

Questions on Locomotive Design and Maintenance

ON page 364 of the August issue of the *Railway Mechanical Engineer* there were submitted to readers a list of eleven questions dealing with locomotives. The answers to these questions are given below and an additional list of ten questions are included. The editor will welcome replies from readers of this section giving their version of the answers to any of these questions. The correct answers to this month's list will be published in the December issue.

The Answers to the August Questions

1. Q.—Why is the main throttle valve of a locomotive designed with two seats? A.—The main throttle valve of a locomotive is designed with two seats to make it easily operated, because owing to the slight difference in the area of the seats the pressure on the lower seat is less than the pressure on the upper seat, thereby causing the valve to be nearly balanced.

2. Q.—To test an air pump for capacity a 3/32-in. orifice is required. In the absence of a 3/32-in. drill could the same results be obtained by drilling two holes, one 1/16 in. in diameter and the other 1/32 in. in diameter? A.—The same results could not be obtained by drilling two holes, one 1/16 in. diameter and one 1/32 in. diameter, because the combined area of these two holes is 0.00384 sq. in. and the area of a 3/16-in. hole is 0.02761 sq. in., a difference of 0.02377 sq. in.

3. Q.—What would be the effect of turning a pair of locomotive main drivers right for left? A.—The effect of turning a pair of main driving wheels left to right would cause the locomotive to run backward when the reverse lever was put in forward position. This would only happen to locomotives which derive their valve motion from the main driving wheels (Stephenson, Walschaert, Baker and Southern). The Young gear would not be affected because it derives its valve motion from the crosshead. The reason for this is that when the main drivers are reversed the eccentric cranks are also reversed and, if the eccentric crank followed the crank pin before reversing, it would lead the crank pin after reversing, thereby changing the angular advance of the eccentric through 180 deg.

4. Q.—Which wears the more rapidly, the top or bottom of a locomotive crosshead? A.—The top of a crosshead wears more rapidly because, on road engines, the direction of movement of the engine is mostly ahead, thereby causing the thrust of the crosshead to be upward during both strokes of the piston due to the angle of the main rod to the center line of the cylinders.

5. Q.—Why are locomotive hub liners usually laid out with six holes rather than five, seven, or eight holes? A.—An even number of holes is used because these liners are usually applied in halves. Six holes are a convenient number because in laying them out the distance between the holes is equal to the radius on which they are spaced (measured from the center of the hub liner).

6. Q.—Would it be practical to lay out the 36 equally spaced stud holes in a cylinder head by stepping around the stud circle with dividers set to the specified distance between studs? A.—No. A slight error in setting the dividers, being accumulative, would increase 36 times by the time the last hole were reached. The stud circle should be quartered, or else divided, into six equal parts by geometrical methods and a new start made every time one of these points is reached. In this manner an increasing accumulative error is avoided.

7. Q.—Why is a brass joint ring for steam pipes impractical? A.—A brass joint ring is impractical because of the different coefficient of expansion between brass and cast iron or steel.

8. Q.—What fittings about a locomotive boiler do not have a standard boiler thread of 12 threads per inch? A.—The safety valves and whistle have a standard pipe thread. (A pipe thread with 11½ threads per inch is apt to be mistaken for a boiler thread.)

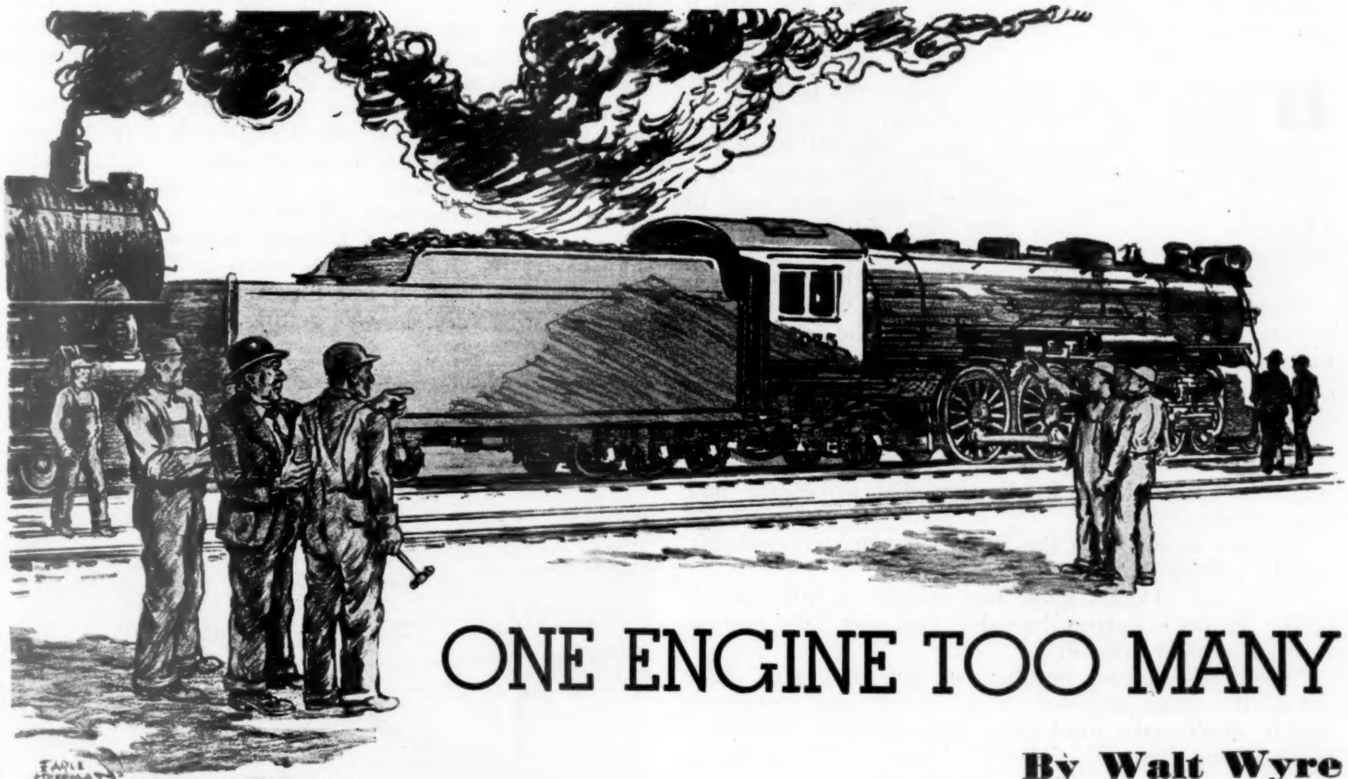
9. Q.—Does any steam get into the steam gage during the operation of a boiler? A.—No steam is supposed to get into a steam gage during operation of the boiler because the heat of the steam would cause the levers in the gage to expand and show a false reading. Hence, the use of a coil or pipe between the boiler and the gage to condense the steam in the pipe to water and prevent the steam from reaching the gage.

10. Q.—In applying a globe valve, one side of which is subject to boiler pressure, should the valve be placed so that the stem packing is exposed to this pressure when the valve is closed? The "blow down" valve on top of a locomotive boiler is an example. A.—The valve should not be placed with the stem packing exposed to the boiler pressure, because if it is, there are two sources of leaks—the valve seat and the packing, whereas if it is applied correctly the valve seat is the only source of a leak. Also, when the packing is exposed to the pressure the stem cannot be repacked.

11. Q.—Why is any sort of by-pass valve unnecessary on old style flat slide-valve locomotives? A.—The slide valve lifts from its seat and acts as a by-pass valve when drifting, or when for any reason pressure in the cylinder exceeds that on the back of the valve.

This Month's Questions

1. Under what circumstances are locomotive rods applied purposely slightly out of tram?
2. What nut about a locomotive is purposely left loose in assembling?
3. For what type of service are locomotives suitable that have Walschaert valve gear arranged to be in the forward motion when link block is at top of the link?
4. Why are most locomotives with Walschaert gear arranged to take the forward motion from the bottom half of the link?
5. What gear in actual use is driven entirely from the crosshead?
6. What gear in actual use is operated by the eccentric crank and has no crosshead connection?
7. What factors determine the minimum permissible thickness of a driver tire?
8. Where should oil holes in truck brasses be located?
9. An engineman's report says: "Front operating lever stuck." What part of the locomotive is referred to?
10. Why is it often permissible to omit the shear keys on the high-pressure main rod strap of a compound locomotive?



ONE ENGINE TOO MANY

By Walt Wyre

THE roundhouse job at Plainville is about the "rawhidingest" job on the S. P. & W. System. Ask H. H. Carter, master mechanic of the Plains division. Carter has lost more sleep and ridden more miles in four years on the Plains division than he had in any ten of his other twenty-eight years of railroading. If the sixteen-hour law applied to officials, it would catch Carter most every day.

Ask Sam Crabtree, the general foreman. Sam has just been in Plainville fourteen months and trying to get away thirteen months and three weeks. Chances are he'll make it soon; things will get better and he'll get a better job or get worse, and Sam will dig out his overalls, providing, of course, he doesn't end up in the "bughouse" sooner than expected.

Ask Jim Evans, the roundhouse foreman, but Jim doesn't let it get his goat, that is not often. If the President's Special was called for ten o'clock and the only available engine ran in the turntable pit at nine-thirty, Jim would just cram half a plug of "horseshoe" in his jaw and remark, "Looks like we might have a little delay."

Not that Jim doesn't try to get the job done. He hates engine failures much as anybody and will work just as hard to prevent them. He has just gotten used to having engines finished after they are called. Jim's idea of Heaven is two extra engines O.K. and ready to go, and an eight-hour day six days a week instead of twelve hours seven days.

Jim thought he was just about to make it when the 5075 returned from the back shop. The 5000's are mountain type engines with boosters equally good for heavy passenger or fast freight. The Plains Division has both.

The 5075 had been overhauled from tank coupler to pilot. She looked mighty nice, too, all shiny and sleek with olive green jacket and black running gear striped with aluminum bronze. Pipe-fitters didn't think much of having to strip a jacket to get to the pipes on her, but pipe-fitters are eternally bellyaching anyway, so that didn't matter.

The whole gang came out to look her over when the switch engine shoved her in on the old cinder-pit track. Evans was anxious to get the 5075 in service and set two machinists and helpers to putting the rods on as soon as the engine was spotted.

"What do you say we break her in on the west local tomorrow?" Evans asked the general foreman.

That suited Sam, so the 5075 was marked up for the local. Jim placed a note in the cab for the engineer to handle her easy while everything was new and tight.

The 5081 came in on No. 10 with driving boxes pounding like two boilermakers on piece work. All rod bushings had been renewed the trip before and were worn almost to the limit. The engineer reported cylinder packing blowing and the boiler feed pump wouldn't supply the engine.

"I guess the bell ringer worked O.K.—or maybe he overlooked reporting it," Evans observed when he saw the work report.

"Think you can get it ready for No. 9 tonight?" Crabtree asked, "or have you got another engine we could use?"

"Aw, we'll make it all right, have to. I'll renew the rod bushings and give the engineer an extra pint of valve oil. She'll make it O.K., unless a federal inspector catches her before she gets back. I'll run her over the drop pit soon as she gets back, drop all the wheels and bore the cylinders. We can use the 5075 on 9 and 10."

The local made it in barely ahead of the hog law. A disgusted engineer wrote across the work report: "A damned pretty engine but she wouldn't pull a sick kitten off a hot brick."

"Maybe she's still tight, not got limbered up yet," Evans observed when he read the caustic report. "I'll

run her on No. 15 today. Harry Stevens will take it out of her."

HARRY is a good engineer, one of the best, but he lost nearly an hour in a hundred and twelve miles with the 5075. They cut her out at Sanford instead of running her through. The 2870, a freight engine, took the train. The newly overhauled engine came back to Plainville pulling a drag, after they set out thirty of the eighty-five empties she started with.

"Engine has no power" was all the engineer reported.

"Run the valves over on the 5075," Evans told Machinist Jenkins. Jenkins is considered the best man in the roundhouse when it comes to squaring valves.

Jenkins checked the valves twice. "Square as a new straight-edge," the machinist told the foreman.

"How are the port openings?"

"Looked O.K. to me," Jenkins replied somewhat testily. He resented the implication that something had been overlooked.

"What's wrong with the 5075?" the master mechanic asked Crabtree that afternoon.

"Why—er—I don't know just exactly—a little lame I think. Evans is having the valves run over," the general foreman replied uneasily.

"Well, it's blamed peculiar we get an engine right out of the shop supposed to be in first-class condition and it won't make local time, and you can't find anything wrong with it. Where's Evans? I'm going to look it over myself," Carter announced.

Evans helping, the master mechanic ran the valves over. Slight changes were made on both sides. "Now let's get her out and see how she sounds," Carter told Evans.

The roundhouse foreman backed the engine out on the table and headed it east. He ran her up the inspection track and backed down the lead where they could get a fairly long run.

The engine sounded good backing up, but they were interested in what she would do going ahead. Just before the switch to the main line was reached, Evans applied the air and pushed the reverse lever ahead. He released the air and opened the throttle, with the reverse lever full ahead. The exhausts were evenly spaced; he moved the reverse nearer the center; the engine barked rhythmically. They made the run up and down the lead three times before Carter was satisfied.

"Sounds all right to me. Run her on 16 tonight. Let me know how she makes it," the master mechanic told Crabtree.

The general foreman didn't need to tell him. The delay report took care of that. She lost forty minutes going up with a lighter train than usual and pulled the local back.

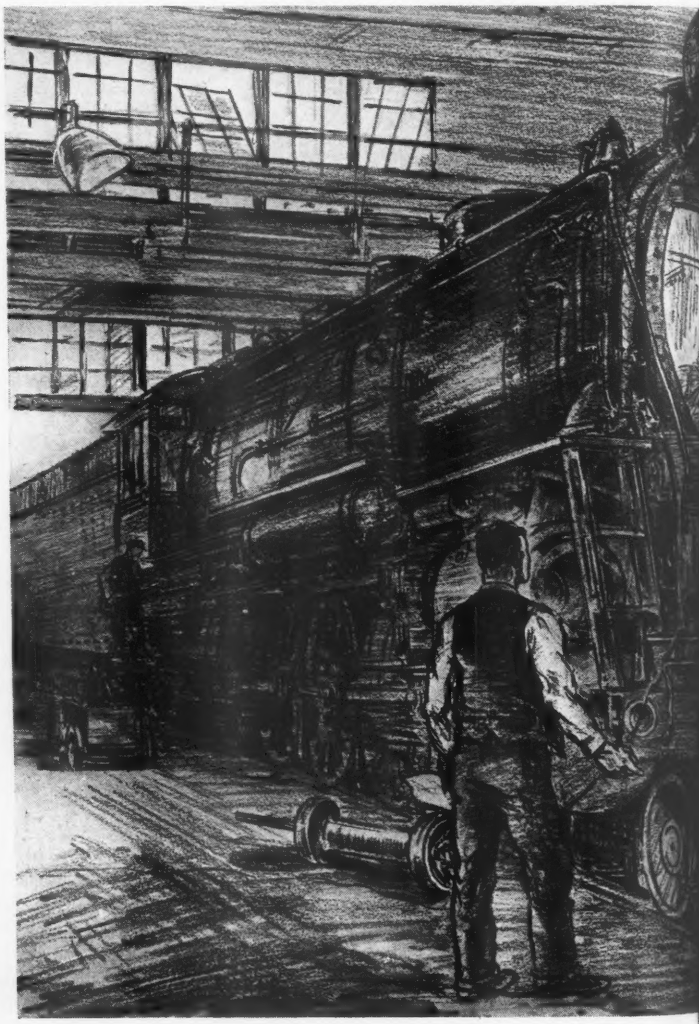
Carter almost had apoplexy. Crabtree wrote letters to every general foreman on the railroad offering to trade jobs. Evans bit off a hunk of "horseshoe" big as a billiard ball and remarked, "I'm glad the boss O.K.'d her instead of me."

The 5078 broke a spring hanger coming in on No. 9 that night, lost three hours. When there's a delay on the Limited, everybody on the railroad hears about it. Just to make things interesting, the 2809 tore herself up on a highball fruit train. Left main rod broke. Knocked the air pump off and fairly stripped herself before the engineer could stop her.

CARTER was waiting at the roundhouse when Crabtree and Evans came to work next morning. "How do you expect me to explain performance like this?" The master mechanic glared with red rimmed eyes at the two foremen. "I want you to find out why the 5075 won't run. Pull the valves—pull the pistons—look at everything on it! I'm going to ride it next trip and I'm telling you, that engine better be right! I'm going to hold you both responsible if it's not."

Crabtree fidgeted, opened his mouth to say something, but changed his mind. Evans took a fresh chew and picked up a bunch of work reports. Using them as an excuse, he beat it to the roundhouse, leaving Crabtree to face the irate official alone.

Evans put Jenkins and Monroe, two of his best machinists, on the 5075 and told them to look her over. He even told them to test the steam gage and check the pops to be sure she was getting full steam pressure.



They followed his instruction without finding a thing to cause the engine to be so lame.

"Blow her down and look at the throttle valve. Maybe it's not opening enough," he told them. They did with the same result.

"Well, I'm going to run her a drag tonight and ride her myself," the foreman told Crabtree just before quitting time that evening.

Crabtree assented wearily.

Evans rode the engine to the first stop for No. 10, got off and returned on the passenger. The drag was light and the 5075 made it in fairly good shape. She caught a light stock train back and made the first successful round trip since coming from the back shop.

The general foreman was surprised to find Evans on

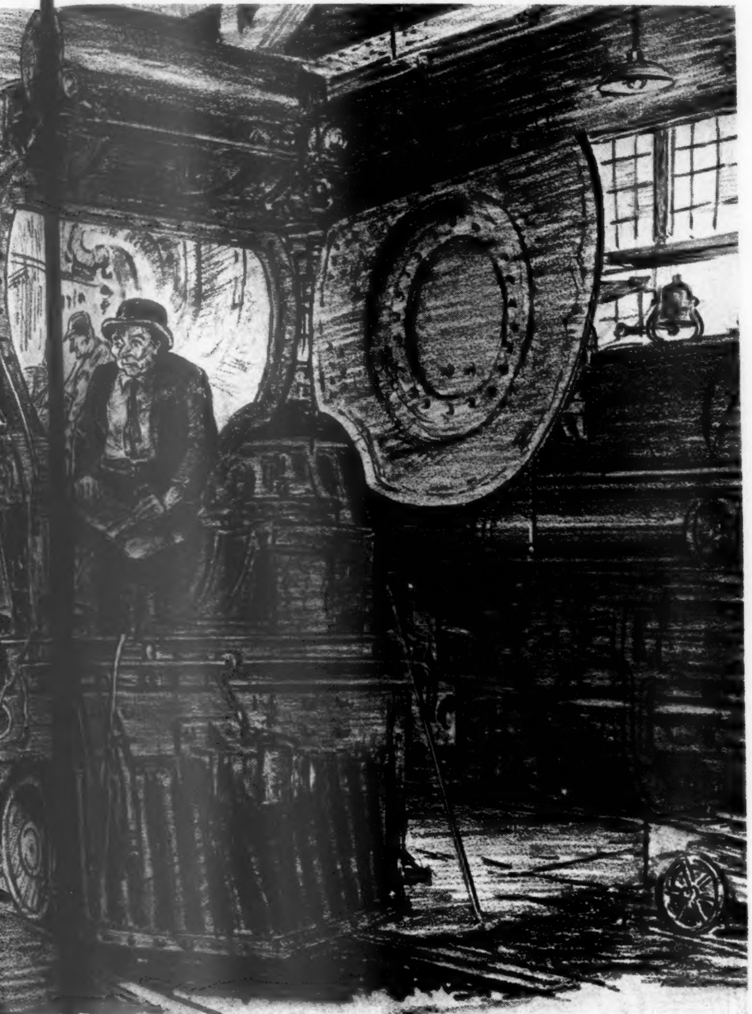
the job next morning when he came to work. "You must have had a pretty good trip, making it back so soon."

"I didn't go all the way; came back on No. 10 so I could get some sleep. The '75 just got in."

"Did you find out the trouble?" Crabtree asked.

"Well, maybe I did and maybe I didn't; let you know about that later."

Evans put a machinist and helper to work on the engine. "Pull both valves and take out the nozzle stand. I'll be back later for a look at them," he told the machinist and went back to the office to see how things were stacking up.



"Say, Mr. Evans, the master mechanic wants to see you at the office." It was the clerk talking.

"The dispatcher wants an extra west for ten-thirty, two 83's today, maybe an extra east, and maybe a drag later on; said he would let you know," Harris, the clerk, told Evans.

"Well, I hope that's all he wants. With the passenger engines, that will just about take everything we got that could get across the turntable under her own power." Evans sat down at his desk and propped his feet on an open drawer. He was resting easy when the phone rang.

"Hello . . . Yes, clerk talking . . . I don't know . . . No, I don't know what it would be. I'll ask the foreman."

"What is it now? Another engine failure?" Evans asked.

"No, but's blamed near as bad. He wants an engine for three-thirty. A football special going west and they're getting here late. Wants to run from here to Canon City in five hours and thirty minutes, three hundred and ten miles. Boy' he'll be stepping on it! What'll I tell him?" Harris asked.

"Don't tell him anything yet. I'm going out in the house. If he calls, tell him I'll call him back." The roundhouse foreman went out to see how the machinist was getting along with the 5075. He found both valves out and the machinist and helper about ready to remove the exhaust nozzle stand. Evans sat down in the smokebox door to wait.

"Say, Mr. Evans, the master mechanic wants to see you at the office. Seems like he's all hot and bothered about something." It was the clerk talking.

"Tell him I'll be right in, but don't tell him where I am," Evans told the clerk.

A FEW minutes later Jim left the roundhouse. He was whistling. The tune was slightly off key and notes gurgled as they made their way through a mouthful of tobacco juice, but he was whistling just the same.

"What engine you going to use on the football special?" the master mechanic asked Evans as he entered the office door.

"Well, about the only thing we've got left is the 5075," the foreman replied.

"Why—dammit—we can't use her. That's an important train; it's the Notre Dame football team. They're already late and if they lose more time on this division, why, it'll just be too bad, that's all, too bad!" The master mechanic was much perturbed.

"I know it, Mr. Carter, but what am I going to do? I was figuring on using the 5092 on No 10, but that would leave me without an engine for her. We haven't got another engine in the house that would stand the beating. Anyway, we know the 5075 won't fall to pieces on us."

"Well, I'm going to leave it up to you, and if the 5075 falls down, just remember I warned you. I'm going to ride it over the division," Carter added.

They still talk about the run the 5075 made with the Special. Six Pullman cars and two baggage cars on the Special and the three hundred and ten miles were made in four hours and fifty minutes.

"Tell me, what did you find wrong?" the master mechanic asked when he came back.

"Well, after we had run the valves over, looked at the pistons, and seen that the throttle was opening, there was only about one thing left. That was the exhaust." Evans shifted his chew of "horseshoe."

"The exhaust!"

"Yes, the exhaust," the foreman continued. "I found the exhaust passages on both sides jammed tight with burrs cut off the flues in the back shop. When the boilermakers cut the ends off the flues to remove them they failed to stop up the exhaust opening and the burrs dropped in and became wedged."

"They're supposed to blow out the passages with air and——" the master mechanic cut in.

"Perhaps they did, but air wouldn't have blown these out. They were jammed so tight I had to use a cutting torch to get them out," Evans explained.

"Well, I'll be damned!" the master mechanic ejaculated.

"Well, now that the 5075 is O.K. we can run some of the other 5000's over the drop pit one at a time and fix them up," Evans remarked.

"Oh, by the way, that reminds me. I have a message to send a 5000 to the mountain division soon as the 5075 is placed in service here," Carter replied.

Evans spat disgustedly.

Die Rack For the Smithshop

THE numerous dies necessary in the blacksmith shop for special forming of forgings for use in the roundhouse, backshop or car shops makes it imperative that some systematic arrangement be provided to care for them and have them stored so that they can be selected for use without delay when needed. In many blacksmith shops the dies are found hanging to the walls or other conventional places or are stored in bins, under work benches or merely leaned in a corner of the shop. This not only indicates a haphazard system of caring for tools but retards the output of the blacksmith shop and prevents periodical inspection of the dies.

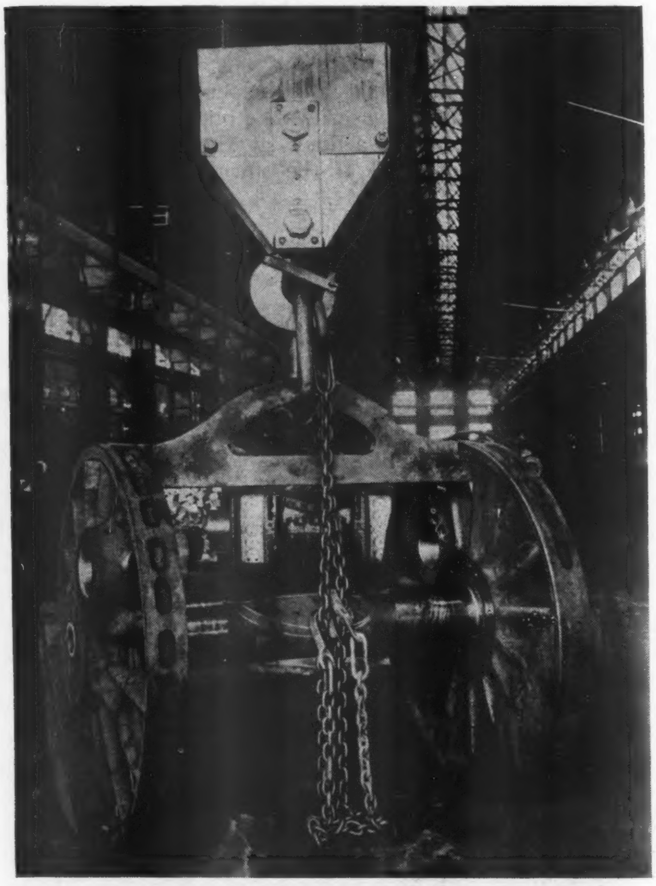
Simple rack for keeping forging dies together

The die rack shown is one of many used by one railroad. It provides for the care of dies for welding round iron under the steam hammer. Each die is correctly marked indicating its size and can be speedily selected by the mechanic when needed. It is made from two pieces of 1¼ in., bar iron which are formed for the ends in one solid piece. A strap of the same size of iron is welded across each end to prevent spreading. A length of 2-in. round iron to which the necessary number of supports are welded is used for the suspension of the dies. The length, height and width of the rack can be governed by the size and number of dies that must be provided for.

Wheel Lifting Bar

THE wheel lifting bar, shown in the illustration, is used at the West Burlington (Iowa) shops of the Chicago, Burlington & Quincy, being an improvement over some of the bars now used at other shops, because a skillful crane operator can insert or remove it from a pair of wheels without the assistance of a floor man.

The lifting bar is made of a 2-in. steel plate cut to the shape indicated, being 65 in. long overall and 51 in. between the shoulders, which serve to prevent the wheels from slipping. The vertical height, overall, is 16 in., or enough to make the bar fairly stable and free from swing when moving down the shop unloaded. To assure adequate strength, the bar width underneath the wheel rim is increased to 4 in. The link which connects the crane hook to the lifting bar is made of 2½-in. round stock, this link being kept at the center of the lifting bar by means of a small centering loop welded in place, as shown in the illustration. The construction of the safety loop on the crane hook is also clearly shown. The chains shown are provided for lifting other materials than mounted wheels.



Wheel lifting bar used at the West Burlington shops of the C. B. & Q.

Further information furnished by the editor upon request

Among the Clubs and Associations

New York Railroad Club

THE opening meeting of the New York Railroad Club, October 18, will be known as "Diesel Night." Important Diesel engine builders will participate, emphasizing the broad principles involved in the application of the Diesel engine to railroad service.

International Acetylene Association Convention

WELDING and cutting of high tensile medium alloy steels; studies of oxyacetylene cut steel plate; hydrocarbon fuel gases for cutting; high-pressure piping; welding class 1 pressure vessels; maintenance of way problems in high-speed transportation; shape cutting of locomotive and car parts; gas welding of aluminum and its alloys, and the safe handling, storage and return of compressed gas containers are among the topics for discussion at the 1935 convention of the International Acetylene Association which will be held at the Hotel Cleveland, Cleveland, Ohio, November 12, 13, 14 and 15. Details regarding the convention may be obtained from V. H. Van Diver, Technical Publicity Department, Union Carbide Company, 205 East Forty-Second street, New York.

Four Mechanical Associations Hold Annual Meetings

SUCCESSFUL meetings of four associations of minor mechanical department officers were held during the week beginning September 15 at the Hotel Sherman, Chicago. The Traveling Engineers' Association and the International Railway General Foremen's Association met on September 16 and 17, the Master Boiler Makers' Association and the International Railway Fuel Association meeting on September 18 and 19. (The latter meeting is covered more in detail elsewhere in this issue.) Individual rooms were provided so that each association could hold its meetings, conduct necessary business and discuss committee reports without interruption or disturbance. No exhibition of railway equipment or supplies was held in connection with any of the meetings. ¶ The largest attendance was at meetings of the International Railway Fuel Association and the Master Boiler Maker's Association, the total registration at each being about 125. It is a significant commentary on the earnestness of the members that many of them attended the association meetings at their own expense and with a view to securing information which would not only improve their own personal knowledge, but react to the distinct advantage of the railroads for which they work.

FUEL ASSOCIATION MEETING

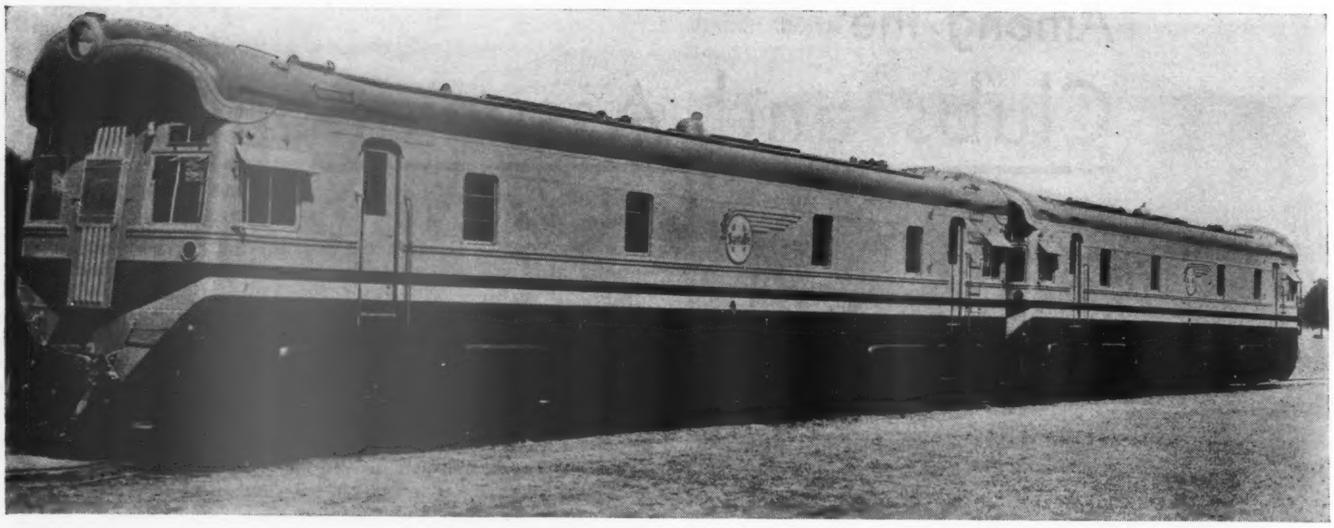
At the International Railway Fuel Association meeting, presided over by President J. M. Nicholson, division master mechanic, A. T. & S. F., many important problems in connection with the purchase, inspection, distribution and use of railway fuel were discussed in detail. Two special speakers on the program included Silas Zwight, mechanical superintendent, N. P., and J. D. Battle, executive secretary of the National Coal Association. Committee reports were presented on 10 subjects, as follows: New Locomotive Fuel Economy Devices, Chairman J. R. Jackson, engineer of tests, M. P.; Stationary Boilers, Coal Section—Chairman R. S. Twogood, assistant engineer, S. P., and Oil Section —Chairman Roy W. Hunt, fuel supervisor, A. T. & S. F.; Fuel Bulletins and Cartoons, Chairman P. E. Bast, fuel engineer, D. & H.; Steam Turbine and Steam Condensing Locomotives, Chairman L. P. Michael, chief mechanical engineer, C. & N. W.; Locomotive Firing Practice, Chairman E. G. Sanders, fuel conservation engineer, A. T. & S. F.; Inspection and Preparation of Coal, Chairman W. R. Sugg, superintendent of fuel conservation, M. P.; Storage of Coal, Chairman A. L. Graburn, fuel agent, C. N.; Fuel Stations, Chairman J. G. Crawford, fuel engineer, C. B. & Q.; Fuel Distribution and Statistics; Fuel Records vs. Fuel Costs. ¶ At the conclusion of the business session, the following officers were elected for the ensuing year: President, C. I. Evans, chief fuel supervisor, M-K-T.; vice-presidents, J. D. Clark, fuel supervisor, C. & O.; J. G. Crawford, fuel engineer, C. B. & Q., and J. R. Jackson, engineer of tests, M. P.; secretary, T. Duff Smith; executive committee, M. F. Brown, fuel supervisor, N. P.; L. E. Dix, fuel supervisor, T. & P.; G. H. Likert, fuel engineer, U. P.; C. N. Page, fuel supervisor, L. V.; A. A. Raymond, superintendent of fuel and locomotive performance, N. Y. C.; W. C. Shove, fuel supervisor, N. Y. N. H. & H.; W. R. Sugg, superintendent of fuel conservation, M. P., and R. S. Twogood, assistant engineer, S. P.

MASTER BOILER MAKERS' MEETING

At the business meeting of the Master Boiler Makers' Association, held September 18 and 19, the opening session was addressed by President K. E. Fogerty, general boiler inspector, C. B. & Q., after which an address was presented by John M. Hall, chief inspector, Bureau of Locomotive Inspection, I. C. C. Committee reports were presented on the following subjects: Boiler and Tender Tank Corrosion and Pitting, in Service and in Storage, Chairman J. C. Callahan, general boiler inspector, C. G. W.; Fusion Welding as Now Applied to Boilers and Tenders, Chairman Ira J. Pool, district boiler inspector, B. & O.; Staybolt Leakage and Cracking of Firebox Side Sheets—Methods of Prevention, Chairman M. V. Milton, chief boiler inspector, C. N.; Application and Maintenance of Arch and Water Tubes with Their Maintenance, Chairman W. H. Moore, general foreman boiler maker, P. M.; special report on Fusible Plugs, by O. H. Kurlfinke, boiler engineer, S. P. ¶ The following officers were elected for the ensuing year: President, O. H. Kurlfinke, boiler engineer, S. P.; first vice-president, Franklin T. Litz, general boiler foreman, C. M. St. P. & P.; second vice-president, Ira J. Pool, district boiler inspector, B. & O.; third vice president, L. E. Hart, boiler foreman, A. C. L.; fourth vice-president, W. N. Moore, general boiler foreman, P. M.; fifth vice-president, C. A. Harper, general boiler inspector, C. C. C. & St. L.; secretary, A. F. Stiglmeier, general foreman boiler department, N. Y. C.; treasurer, W. H. Laughridge, general foreman boiler maker, H. V.; executive board: Secretary, John Harthill, general foreman boiler maker, N. Y. C.; M. A. Foss, service engineer, Locomotive Firebox Company; George L. Young, foreman boiler maker, Reading; C. W. Buffington, general master boiler maker, C. & O.; A. W. Novak, general boiler inspector, C. M. St. P. & P.

TRAVELING ENGINEERS' MEETING

Reports presented at the thirty-eighth annual convention of the Traveling Engineers' Association, held on September 16 and 17, included Recommended Practice for Train Handling with Modern Brake Equipment, Chairman J. P. Stewart, general supervisor of air brakes, M. P.; The Operation of Gas-Electric and Diesel-Electric Equipment, Chairman M. D. Franey, consulting engineer, N. Y. C.; Fuel, Chairman G. M. Boh, district road foreman of engines and fuel supervisor, Erie. The meeting was presided over by President J. M. Nicholson, division master mechanic, A. T. & S. F., necessary details of the program having been arranged by Secretary W. O. Thompson, N. Y. C. Short addresses were made by A. G. Pack, who recently retired as chief inspector, Bureau of Locomotive Inspection, I. C. C. John M. Hall, who succeeded Mr. Pack, also was present and made a few appropriate remarks. ¶ At the conclusion of the business session, the following officers were elected for the ensuing year: President, A. T. Pfeiffer, road foreman of engines, N. Y. C.; first vice-president, D. L. Forsythe (retired), St. L.-S. F.; second vice-president, J. D. Clark, fuel supervisor, C. & O.; third vice-president, J. P. Stewart, general supervisor of air brakes, M. P.; fourth vice-president, J. C. Lewis, R. F. & P.; fifth vice-president, M. A. Daly, fuel supervisor, N. P. W. O. Thompson, N. Y. C., was continued as secretary.



NEWS

THE CAMBRIA & INDIANA has received bids for making body repairs to from 250 to 1000 hopper cars of 50 tons' capacity.

THE CHICAGO, ROCK ISLAND & PACIFIC has contracted with the Ryan Car Company, Chicago, for the conversion of 320 box cars into single-deck stock cars.

THE ATCHISON, TOPEKA & SANTA FE is rebuildiing 150 refrigerator cars which now have steel underframes and wooden superframes. The rebuilt cars will have both steel underframes and steel superframes and improved insulation, the cost of reconstruction being $1,935 a car.

THE NEW YORK CENTRAL has placed an order with Geo. P. Nichols & Bros., Inc., Chicago, for a 300-ton capacity transfer table for its locomotive shop at West Albany, N. Y. This will replace a table furnished by the same company which has been in service since 1905.

Long Diesel Locomotive Run

WHAT is believed to be "the longest run ever made by a heavy, Diesel-powered train of standard all-steel equipment" was recently completed over the Baltimore & Ohio by the twin unit Diesel-electric locomotive built by the Electro-Motive Corporation for test service on American railroads. The run was made from Jersey City, N. J., to St. Louis, Mo., a distance of 1,114 miles, after which the locomotive, following a two-hour stop, continued from St. Louis with a regular Alton train to Chicago for an additional run of 284 miles.

On the run from Jersey City to St. Louis the locomotive hauled ten standard steel cars, or an average of 757 tons; between St. Louis and Chicago 12 cars were hauled, or an average of 808 tons. The locomotive itself, which weighs 250 tons, is described in a Baltimore & Ohio statement as "the most powerful of its type yet placed in road service in this country." It consists of two 1800 hp. units of identical construction, each of which can be operated separately on lighter trains. When operated together the two units are controlled by one engineer.

Powerful Diesel Locomotive Delivered to Santa Fe

THE Atchison, Topeka & Santa Fe has received from the Electro-Motive Corporation the most powerful Diesel locomotive ever placed in service. If exhaustive tests prove successful, the locomotive will be used to haul the "Chief" between Chicago and California, on a faster schedule than at present. This 3,600-hp. locomotive actually is a multiple unit of two identical sections, which can be operated singly or together, or coupled to any desired number of similar units, all of which can be

New Equipment

CAR ORDERS

Purchaser	No. of cars	Type of car	Builder
Canadian National[1]	250	Automobile	Canadian Car & Fdry. Co.
	80	Sand	
	150	Automobile	Nat'l Steel Car Corp.
	8	Snow plows	
	200	Refrigerator	Eastern Car Co.
	250	Gondola	
	250	Refrigerator	Company shops
Canadian Pacific[1]	700	Steel-sheathed box	Canadian Car & Fdry. Co.
	150	Refrigerator	Nat'l Steel Car Corp.
	100	Hopper	
	170	Comp. gondola	
Chesapeake & Ohio......	200	50-ton auto. box (equip. with loaders)	Pullman-Standard Car Mfg. Co.
C. N. O. & T. P.......	200	40-ton auto.	Pressed Steel Car Co.
Grand Trunk Western....	100	70-ton gondola	Magor Car Corp.
Internat'l Petroleum Co., Ltd.	2[2]	40-ton tank	American Car and Foundry Co.
Norfolk & Western......	10[3]	50-ton hopper	Company shops at Roanoke, Va.
St. Louis-San Francisco ..	2	Lounge	Company shops
Seaboard Air Line.......	2[4]	660-hp. rail motor	Electro-Motive Corp. St. Louis Car Co.

CAR INQUIRIES

Purchaser	No. of cars	Type of car	Builder
California Dispatch Line..	2	8,000 gal. tank	....
Missouri & North Arkansas	2 trains	Each consisting of one 75-ft. 10-in. steel mail and baggage car equipped with gas-electric power plant and one 55-ft. trailer coach	....

LOCOMOTIVE ORDERS

Purchaser	No. of locos.	Type of loco.	Builder
Canadian National[1]	5	4-8-4 (U-2-D)	Montreal Loco. Works
	5	4-8-4 (U-4-O)	
	5	2-8-2 (S-4-B)	Canadian Loco. Co.
Coos Bay Lumber Co.....	1[5]	2-8-2	American Loco. Co.
Detroit, Toledo & Ironton.	4[6]	2-8-4	Lima Loco. Works
Estrada de Ferro de Goyez, Brazil	1	2-6-6-4	Baldwin Loco. Works
Montreal Harbor Com....	3[7]	0-6-0	Montreal Loco. Works
Norfolk & Western.......	2	Mallet	Company shops at Roanoke, Va.
Temiskaming & Northern Ontario	2[8]	4-8-4	Canadian Loco. Co.
United Fruit Co..........	1[9]	2-8-2	Baldwin Loco. Works

controlled by a single operator. Streamlining has been obtained by modifications in the jackets that cover the apparatus; by the molding and slope of the blunt ends; and the flowing steel "skirts," with removable sections, that cover the wheels. Appearance is enhanced by an attractive color scheme done in black, cobalt and sarasota blues, golden olive and pimpernel scarlet. This scheme has been worked out by the Art and Color department of the General Motors Corporation. The Santa Fe emblem of a maltese cross in a circle, combined with the sloping head and streaming headdress of an Indian chief appears on the sides of each unit in full color, taking the place of the usual letters of identification. The name "Super Chief," chosen for the train on which the Diesel is to be used, has been etched on heavy glass panels set into the ends of the locomotive between the forward windows.

Supply Trade Notes

The Electro-Motive Corporation has moved its main office and plant from Cleveland, Ohio, to LaGrange, Ill.

S. C. Johnson, chemical engineer of the Dearborn Chemical Company, Chicago, has been appointed assistant to the vice-president.

S. P. Goodloe, Mutual building, Richmond, Va., has been appointed sales representative of the Union Spring & Manufacturing Company, New Kensington, Pa.

Avery & Saul Co., South Boston, Mass., has been appointed distributors of seamless steel and Toncan iron boiler tubes for the Globe Steel Tubes Company, Milwaukee, Wis.

Frank Liebich of the industrial sales division of the Harnischfeger Corporation, Milwaukee, Wis., has been appointed district manager in charge of operations in the Detroit area.

George H. Snyder, representative of the American Steel Foundries, Chicago, with headquarters at St. Paul, Minn., has been appointed sales agent to succeed P. J. Kalman, deceased.

John W. Carpenter, for 16 years Cleveland (Ohio) district sales manager of the Otis Steel Company, has become assistant manager of sales, Sheet and Strip division of the Republic Steel Corporation, Youngstown, Ohio.

B. C. Wilkerson and Trent Mays, 360 Maryland avenue, Portsmouth, Va., have been appointed sales representatives in the Norfolk area for Jenkins' dust guards, a product of the George O. Jenkins Company, Bridgewater, Mass.

The Rawlplug Company, Inc., New York, has organized the Rawlplug Dallas Company, 1907 Canton street, Dallas, Tex., to handle the sales of the company's products in the northern section of Texas. D. P. Fletcher has been placed in charge of the new office.

John F. Raps, central manager, and C. G. Learned, eastern manager, of the Okadee Company and the Viloco Railway Equipment Company, at Chicago and New York, respectively, have been appointed vice-presidents, with headquarters in the same cities.

Stockholders of the Inland Steel Company have approved a plan of reorganization to make effective the merger of Joseph T. Ryerson & Son, Inc., with Inland. Ryerson stockholders have also approved the plan and only formalities remain to be completed.

The merger of the Republic Steel Corporation and the Corrigan, McKinney Steel Company has been completed. Donald B. Gillies, who has been president of the Corrigan, McKinney Steel Company, will be a vice-president and a director of the Republic Steel Company.

A. E. Heroux, Detroit district manager of the paint division of Aluminum Industries, Inc., has been appointed general manager of the permite paint sales division, with headquarters at Cincinnati, Ohio, to succeed A. B. Anderson, resigned.

Herbert J. Watt, since 1928 manager of sales, railway materials, of the Jones & Laughlin Steel Corp., Pittsburgh, Pa., has been appointed district sales manager at New York to succeed the late Robert M. Kilgore. Mr. Watt has been with the company since December 1, 1925.

E. G. Goodwin, until recently connected with the Standard Coupler Company, New York, is now associated as chief engineer with the Graham-White Sander Corporation, Roanoke, Va. For several years preceding his association with the Standard Coupler Company Mr. Goodwin was connected with the mechanical department of the Norfolk & Western.

R. J. Wysor, vice-president in charge of operations of the Republic Steel Corporation, Youngstown, Ohio, has been elected executive vice-president and general manager, to succeed Ben F. Fairless, who has resigned to go with the United States Steel Corporation. C. M. White, assistant vice-president of the Republic Steel Corporation, has been elected vice-president in charge of operations, to replace Mr. Wysor.

G. M. Hanrahan, for the past ten years with the Haskelite Manufacturing Corporation, has been appointed assistant sales director of the Technical Division of the Algoma Plywood & Veneer Company, whose main office is at 228 North LaSalle street, Chicago. Mr. Hanrahan, who will have an office at the Detroit Leland Hotel, Detroit, Mich., will serve the territory of Ohio, Michigan, New York and Pennsylvania.

George Kirtley, formerly in charge of the Pittsburgh district for the Plymouth Locomotive Works, division of The Fate-Root-Heath Company, Plymouth, Ohio, has been appointed assistant to the vice-president, E. W. Heath, in charge of locomo-

(*Continued on next left-hand page*)

Miscellaneous Orders

Road	Type of equip.	For use on	Order placed with
American Railroad of Puerto Rico	Bearings and boxes	Journals of two pass. cars	Timken Roller Bear. Co.
Amtorg Trading Corp.	14,000 frt.-car axles (4,500 tons)	....	Carnegie Steel Co.; Bethlehem Steel Co.
C. B. & Q.	Bearings and boxes	All axles of scale test car [10]	Timken Roller Bear. Co.
Grand Trunk Western	Bearings and boxes	Engine trucks of 3 existing 4-8-4 (U-3-A) locos.	Timken Roller Bear. Co.
New York Rapid Transit Co. (B-M-T)	Bearings	Motors of 15 articulated five-section train units [11]	S K F Industries, Inc.
Pennsylvania	Bearings and boxes	Engine and trailer trucks of 8 existing K-4-s (4-6-2) pass. locos.; also bearings for all axles of tenders.	Timken Roller Bear. Co.
Peiping-Liaoning Ry. of China	4 sets Thermic syphons	Exist. equip.	Locomotive Firebox Co.
Seaboard Air Line	Bearings and boxes	3 rail cars [12]	Timken Roller Bear. Co.

[1] An appropriation of $15,000,000 was provided for railway purposes in a recent act of Parliament. Railway equipment orders amounting to $9,821,563 have been allocated to five manufacturing plants in Canada. The Canadian National will receive $6,791,155 worth of new cars and locomotives, equipment to the value of $1,325,000 being built in its own shops, and the Canadian Pacific orders will total $4,355,408.

[2] For export.

[3] To be of all steel, covered, for bulk shipments of cement, lime, etc. The N. & W. expects also to build 500 all-steel hopper cars of 57½ tons capacity in its Roanoke shops, commencing construction as soon as materials can be purchased and assembled.

[4] Streamlined baggage and mail oil-electric cars. The car bodies will be built by the St. Louis Car Company.

[5] This locomotive will have 20-in. by 24-in. cylinders and a total weight in working order of 205,000 lb.

[6] These locomotives will have 25-in. by 30-in. cylinders and a boiler pressure of 250 lb. The tenders will each have a capacity of 22 tons of coal and 22,000 gal. of water.

[7] These switchers will have 20-in. by 26-in. cylinders and a total weight in working order of 143,000 lb.

[8] These locomotives will have 22½-in. by 30-in. cylinders, 69-in. driving wheels a boiler pressure of 275 lb., and an approximate weight in working order for the engine of 370,000 lb., and of the tender, 272,000 lb. They will have a maximum tractive force of 54,500 lb. The tender will have a capacity of 11,000 imperial gallons of water and 20 tons of fuel. They will be equipped with Nicholson thermic syphons, Elesco Type E superheaters, Elesco exhaust steam injectors, B. K. stokers, Franklin locomotive boosters on rear trailing axles and SKF roller bearings on engine and trailing trucks and tender trucks. Delivery is expected about March, 1936.

[9] For service in Cuba.

[10] Being built by the Baldwin Loco. Works.

[11] Being built by the Pullman-Standard Car Mfg. Co. These cars are to be equipped with General Electric motors on which 180 sets of SKF bearings will be used. Ten additional trains ordered from the St. Louis Car Co. will have Westinghouse motors on which 120 sets of SKF bearings will be used.

[12] Being built by the American Car and Foundry Company.

tive sales and advertising, with headquarters at Plymouth. Mr. Kirtley has had 12 years' experience in the application of steam and internal-combustion locomotives to a wide variety of services.

William H. Heckman has become a sales representative of the T-Z Railway Equipment Company, Inc., and the associated Morris B. Brewster Company, Inc., with headquarters at Chicago. Mr. Heckman was formerly vice-president of the Viloco Railway Equipment Company and the Okadee Company, associated companies. For several years he served in various capacities in the mechanical department of the C. B. & Q.

T. I. Phillips, works manager at East Pittsburgh, Pa., of the Westinghouse Electric & Manufacturing Company, has been appointed general works manager of the company. In his new position, Mr. Phillips who will serve as central authority for all manufacturing operations of the company, has been with Westinghouse since 1915. He has held various positions of executive responsibility in factories of the company, serving also as works manager of the Nuttall Plant and, since 1933, as works manager at East Pittsburgh.

The A. M. Byers Company, Pittsburgh, Pa., has expanded its activities to include the manufacture and sale of steel pipe. Several years ago this company completed a modern wrought iron mill at Ambridge, Pa., for manufacturing genuine wrought iron under its new process. Following this, operations were further expanded to include the reintroduction of a wide range of wrought iron products, including plates, sheets, merchant bars, angles, structurals and forging billets. The third step in broadening the sales and manufacturing activities is the manufacture and sale of steel pipe, in addition to wrought iron pipe.

Steel and Tubes, Inc., Cleveland, Ohio, a subsidiary of the Republic Steel Corporation, because of increased business activity in the territory served from Philadelphia, Pa., has recently created a new sales district in that territory. It is headed by C. J. Boyd, formerly of the Brooklyn, N. Y., sales organization, as district manager. The new district consists of the states of North and South Carolina, Virginia, Maryland, Delaware, southern New Jersey, including Trenton, also southeastern Pennsylvania. Part of the new district was formerly included in the New York sales district and part in the Birmingham sales district. J. F. Keeler, of the sales promotion department in Cleveland, has been transferred to Brooklyn, to head the sales promotion work in the east; I. H. Anderson, of the Philadelphia office has been transferred to Brooklyn, and J. S. Anderson, of the Detroit office, has been transferred to the new Philadelphia office.

The United States Steel Corporation has approved a unified plan of operation of the Carnegie Steel Company and the Illinois Steel Company, both wholly-owned subsidiaries of the United States Steel Corporation, under which the direction of production and sales will be controlled from a central office to be set up in Pittsburgh, Pa. Benjamin F. Fairless, formerly executive vice-president of the Republic Steel Company, will head the Carnegie-Illinois Steel Corporation, and G. Cook Kimball, vice-president of the Illinois Steel Company, with headquarters at Chicago, will be vice-president of the new organization, in charge of the Chicago district. Mr. Kimball will take over the duties of George G. Thorp, who retires as president of the Illinois Steel Company under pension in accordance with his expressed wish.

Mr. Fairless was born on May 3, 1890, at Pigeon Run, Ohio. He was educated at

Benjamin F. Fairless

Ohio Northern University, Ada, Ohio, and Wooster University, Wooster, Ohio. He entered railroad service in 1912 as a transitman on the Wheeling & Lake Erie at Brewster, Ohio. In May, 1914, he became associated with the Central Steel Company, at Massillon, Ohio, and later served as its vice-president and general manager until 1926, when that company was merged with the United Alloy Steel Corporation to form the Central Alloy Steel Corporation. Mr. Fairless became vice-president and general manager of the new company and later, president. When the Central Alloy and other steel compa-

(c) Moffett Studio
G. Cook Kimball

nies were absorbed by the Republic in 1929, he became first vice-president of the new Republic organization.

Mr. Kimball graduated from Harvard University in 1900, and in the following year entered the steel industry in the engineering department of the American Tin Plate Company at Pittsburgh, Pa. In 1905 he was appointed chief engineer of the American Sheet & Tin Plate Company and held that position until 1931, when he was elected a vice-president of that company. In June, 1932, he was elected vice-president of the Illinois Steel Company, with headquarters at Chicago.

Mr. Thorp was born at Pittsburgh, Pa., on June 29, 1869, and was graduated from the University of Wisconsin in 1891. He began his career as engineer of tests of the Illinois Steel Company at Chicago in 1892 and was appointed general superintendent of the Joliet, Ill., works in 1898. From 1901 to 1905 he constructed and operated the steel mills at Clairton, Pa., and in the latter year was elected vice-president of the Illinois Steel Company in charge of design, construction and operation of the steel mills at Gary, Ind. In June, 1932, he was elected president of the Illinois Steel Company.

The Miller Steel Company, Inc., Newark, N. J., has been appointed warehouse distributor of mechanical seamless steel tubing, for the Globe Steel Tubes Company, Milwaukee, Wis.

J. D. Benfield and Robert Turrell, formerly with the Electrical division of Steel and Tubes, Inc., have formed their own organization, known as Turrell & Benfield, Inc., with headquarters at Detroit. They are representing Electrunite Steeltubes and Fretz-Moon conduit products in the Michigan territory.

Obituary

Clive Runnells, vice-president of the Pullman Company, Chicago, died in Santa Barbara, Cal., on September 12.

David J. Champion, president of the Champion Rivet Company, Cleveland, Ohio, died suddenly on September 10, at his home in Cleveland.

Nicholas A. Doyle, vice-president of the American Car and Foundry Company at St. Louis, Mo., died after a brief illness in Chicago, on September 9, at the age of 68 years.

William H. Sanford, for about 40 years with the American Car and Foundry Company and its predecessors, at Buffalo, N. Y., most of this time district manager at the Buffalo plant and later assistant vice-president of the American Car and Foundry Company, died on September 22 in Buffalo, at the age of 84 years.

William H. Hunter, manager of the Chicago office of the Pratt & Whitney Company, died suddenly in Cleveland, Ohio, on September 12, from a heart attack. He was attending the National Machine Tool Builders Association Exposition in progress at that city from September 11 to 21. Mr. Hunter had been with Pratt & Whitney continuously for thirty-two years in various sales capacities. He began as a clerk in the Philadelphia sales office at the age of sixteen. He served continuously at that office and eventually became its manager in 1928, which position he held for two years. In 1930 he was transferred to Chicago to become manager of the Machinery Division of the Pratt & Whitney Chicago

(Continued on next left-hand page)

Office, which position he had held ever since. Mr. Hunter was born in Philadelphia forty-eight years ago.

S. A. Witt, for many years western manager of the Detroit Lubricator Company at Chicago, died on August 10, after about a year's illness. Mr. Witt was born in 1884 in Wisconsin. He was educated in the Chicago public schools and began his business career with the Newport Boiler

S. A. Witt

Company, Chicago. His next connection was with the American Radiator Company at Peoria, Ill., subsequently he entered the service of Kehm Brothers, Chicago. During 1917-18, Mr. Witt served as the engineer in charge of the installation of the heating system at Camp Grant. In the latter year he became associated with the Detroit Lubricator Company as western sales manager.

George Slate, vice-president and a director of the Simmons-Boardman Publishing Company, and business manager of Marine Engineering & Shipping Age, and

George Slate

the Boiler Maker & Plate Fabricator, died on September 26, at Overlook Hospital, Summit, N. J., at the age of 61 years. Mr. Slate was born on September 27, 1874, at Oxford, Mich., and was educated in the public schools of Alma and Grand Rapids, Mich. He started his business career in the classified advertising department of the Philadelphia Press, later removing to New York, where he served with the New York Journal in a similar capacity. His association with Marine Engineering has extended over a period of about 34 years, he having joined the staff of that publication as an advertising salesman on October 14, 1901. He was later elected a vice-president of Aldrich Publishing Company, which at that time published that periodical. In 1905 the company acquired The Boiler Maker and Mr. Slate's jurisdiction was extended to include that journal as well as Marine Engineering. In 1920 the Aldrich Publishing Company, with its two publications, was acquired by the Simmons-Boardman Publishing Company and shortly thereafter Mr. Slate was elected a director of the latter company, on which board he had since served continuously. He was an associate member of The Society of Naval Architects and Marine Engineers and for 15 years served as secretary and treasurer of the Boiler Makers' Supply Men's Association. He was long interested in the affairs of that organization and the Master Boiler Makers' Association. Mr. Slate also took an active part in the work of the Associated Business Papers, Inc., serving several years as a director, and in the business paper division of the Audit Bureau of Circulations.

Personal Mention

General

B. R. Jones has been appointed assistant mechanical engineer of the New York, New Haven & Hartford, with headquarters at New Haven, Conn.

Kenneth Cartwright, assistant mechanical engineer of the New York, New Haven & Hartford at New Haven, Conn., has been appointed mechanical engineer, with headquarters at New Haven.

J. C. Hassett, mechanical engineer of the New York, New Haven & Hartford at New Haven, Conn., has been appointed assistant to general mechanical superintendent, with headquarters at New Haven.

David P. Carey, superintendent of shops of the New York, New Haven & Hartford at Readville, Mass., has been appointed assistant general mechanical superintendent. Mr. Carey's duties will be largely concerned with standards of maintenance and enginehouse work as related to locomotive performance.

Wesley B. Berry, master mechanic of the St. Louis-San Francisco at Kansas City, Mo., has been appointed assistant superintendent motive power, with headquarters at Springfield, Mo. Mr. Berry was born in St. Louis, Mo., on December 13, 1880. He was educated in the public schools of Denison, Tex., and entered the service of the Texas Pacific at Marshall, Tex., as a machinist apprentice in 1897. Upon completion of his apprenticeship he worked as a machinist for various railroads in the south and west, entering the employ of the St. Louis-San Francisco at Sherman, Tex., in 1906. He served at various points on the Frisco as a machinist and as enginehouse foreman until his promotion to the position of general foreman at North Springfield, Mo., in 1919. He was appointed master mechanic of the Northern Division, with headquarters at Kansas City, in May, 1922.

Master Mechanics and Road Foremen

M. L. Crawford, general foreman of the St. Louis-San Francisco at Ft. Smith, Ark., has been appointed master mechanic of the Central division and Texas Lines, with headquarters at Sherman, Tex.

Don Nott has been appointed acting master mechanic of the Beardstown division of the Chicago, Burlington & Quincy, with headquarters at Beardstown, Ill., to take the place of W. E. Corya, who is off duty because of ill health.

W. G. Hall, master mechanic of the St. Louis-San Francisco at Sherman, Tex., has been transferred to the position of master mechanic at Kansas City, Mo., to succeed W. B. Berry. Mr. Hall was born in 1884 at Palestine, Tex. He attended

W. G. Hall

high school and in 1901 entered the employ of the International & Great Northern (now the Missouri Pacific), on which road he served consecutively as machinist apprentice, machinist, enginehouse foreman, master mechanic and shop superintendent. In 1920 he became general foreman of the St. Louis-San Francisco at West Tulsa, Okla., and in 1923 was promoted to the position of assistant master mechanic at Monett, Mo. In 1928 he was appointed master mechanic at Sherman.

Car Department

Oscar N. Schoppert, general car foreman of the Western Maryland, with headquarters at Cumberland, Md., has been appointed master car builder, with headquarters at Hagerstown, Md. Mr. Schoppert was born on May 22, 1881, at Piedmont, W. Va., and was educated in the public schools of Piedmont. He entered railway service in April, 1901, with the

(Continued on next left-hand page)

Western Maryland as car repairman at Ridgeley, W. Va. In December, 1912, he became clerk; in June, 1914, chief clerk to master car builder at Hagerstown; in April, 1921 traveling car inspector, and in January, 1923, assistant to master car builder. Mr. Schoppert later became general car foreman at Cumberland.

Shop and Enginehouse

J. W. O'Meara, superintendent of shops of the New York, New Haven & Hartford at Van Nest, N. Y., has been appointed superintendent of shops, with headquarters at Readville, Mass.

E. J. Ball has been appointed superintendent of shops of the New York, New Haven & Hartford, with headquarters at Van Nest, N. Y.

E. J. Hausbach, general foreman of the Decatur, Ill., locomotive shop of the Wabash, has been appointed shop superintendent, succeeding H. C. Caswell, deceased. Mr. Hausbach was born on September 17, 1882, at Ft. Wayne, Ind. He completed grade school in 1895, and was in the employ of the Ft. Wayne Electric Works as a machinist apprentice from 1895 to 1899; the Western Gas Construction Company, Ft. Wayne, from 1899 to 1900; the Bass Foundry & Machine Company, Ft. Wayne, 1900 to 1901; the Lima Locomotive Works, Lima, Ohio, from 1901 to 1902; the Cincinnati Northern at Van Wert, Ohio, from January to July, 1902, and the Erie at Huntington, Ind., from July to November, 1902. Mr. Hausbach then became enginehouse foreman of the Pennsylvania at Ft. Wayne. He entered the service of the Wabash in July, 1903, as a machinist at Ft. Wayne. In June, 1906, he was appointed machine foreman at Ft. Wayne; on October 1, 1913, machine foreman at Decatur, and on November 1, 1917, general foreman at Decatur.

E. J. Hausbach

Obituary

Frank N. Hibbits, consulting superintendent motive power of the Lehigh Valley, died on September 26 in the Sacred Heart Hospital at Bethlehem, Pa. Mr. Hibbits, who was born on February 3, 1866, at Muncie, Ind., was a graduate of the Rose Polytechnic Institute, Terre Haute, Ind. He entered railroad service in 1886, serving consecutively to August, 1891, as a machinist and as a draftsman on the Cleveland, Columbus, Cincinnati & Indianapolis (now the Cleveland, Cincinnati, Chicago & St. Louis). He then became engineer of tests of the New York, Lake Erie & Western (now the Erie), and from April, 1892, to March, 1894, was mechanical engineer of that road. From March, 1894, to November, 1895, he was master mechanic of the Rochester Division; from November, 1895, to June, 1899, freight trainmaster, New York Division of the Erie, with headquarters at Port Jervis, N. Y., and from June, 1899, to May, 1901, superintendent, Jefferson Division at Carbondale, Pa. In the latter month he became mechanical engineer of the Union Pacific and in March, 1903, was appointed assistant superintendent motive power and machinery. From March, 1904, to July, 1904, he was consulting mechanical engineer of the Southern; from July, 1904, to May, 1906, mechanical superintendent, New York, New Haven & Hartford, and from May, 1906, to February 1, 1929, superintendent motive power, Lehigh Valley, at Bethlehem. He was appointed consulting superintendent of the Lehigh Valley in February, 1929.

General W. W. Atterbury

General W. W. Atterbury, who resigned last April as president of the Pennsylvania, died on September 20 at the Bryn Mawr (Pa.) Hospital.

General Atterbury, who had been in poor health since July, 1934, had been associated with the Pennsylvania for nearly 49 years and was one of the few railroad presidents of this country who came up through the mechanical department.

Gen. W. W. Atterbury

William Wallace Atterbury was born at New Albany, Ind., on January 31, 1866, and spent his boyhood in Detroit, Mich. He was graduated from Yale University in 1886 with the degree of Bachelor of Philosophy. He entered the service of the Pennsylvania Railroad on October 11 of the same year as an apprentice in the Altoona shops. From 1889 to 1892 he served as assistant road foreman of engines on various divisions of the Pennsylvania and the Philadelphia, Baltimore & Washington. In 1892 he was promoted to assistant engineer of motive power in the Pennsylvania Company, Northwest System. From 1893 to October 26, 1896, he was master mechanic at Fort Wayne, Ind. On the latter date, he was promoted to superintendent of motive power with headquarters at Altoona, and on October 1, 1901, was advanced to the position of general superintendent of motive power of the Lines East of Pittsburgh and Erie.

General Atterbury's affiliation with the transportation department dated back to January 1, 1903, when he was appointed general manager of the Lines East of Pittsburgh and Erie. On March 24, 1909, he was elected fifth vice-president in charge of transportation and on March 3, 1911, upon a change in the organization, was elected fourth vice-president and a director. The practice of designating the several vice-presidents by number was changed on May 8, 1912, at which time Mr. Atterbury was elected vice-president in charge of operation, his jurisdiction still covering at that time the lines East of Pittsburgh. From May 17, 1916, to June, 1919, he was also president of the American Railway Association.

Recognition of Mr. Atterbury's ability as a transportation officer was particularly signalized by his being requested by Secretary of War Newton D. Baker, shortly after war was declared against Germany, to go to France and assume charge, as director-general of transportation of the American Expeditionary Forces, of the details of organization of the American railway transportation facilities in France. He sailed for Europe in August, 1917. On October 5, 1917, he was commissioned a brigadier-general and his appointment as such was confirmed by Congress three days later. General Atterbury returned to the United States on May 31, 1919, after having set up a record of performance for which American railway men have never been called upon to make any apologies. He was made the recipient of the distinguished service medal of the United States, was made a commander of the Legion of Honor by France, a companion of the Most Honorable Order of the Bath by Great Britain, and a commander of the Order of the Crown by Belgium.

Upon the termination of federal control, General Atterbury resumed his duties as vice-president in charge of operation of the Pennsylvania, but this time having jurisdiction over the entire system as a result of the creation of the new plan of organization into regions. He continued in this capacity until November 15, 1924, when he was elected vice-president of the corporation without designation, so that he might act in a more general executive capacity, aiding the president in his administrative duties and acting for the president in his absence. On October 1, 1925, he was elected president to succeed Samuel Rea.

General Atterbury was an honorary member of the American Society of Mechanical Engineers, a member of the American Academy of Political and Social Science and the American Philosophical Society. He had been awarded honorary LL.D. degrees by the University of Pennsylvania (1919), Yale University (1926) and Villa Nova (1927).